the OIL AND GAS JOURNAL
PUBLISHED WEEKLY FEBRUARY 29, 1960

Weekend "coasting" saves money in the field ▸ 46

Reason for high stocks: Warm weather, high runs ▸ 48

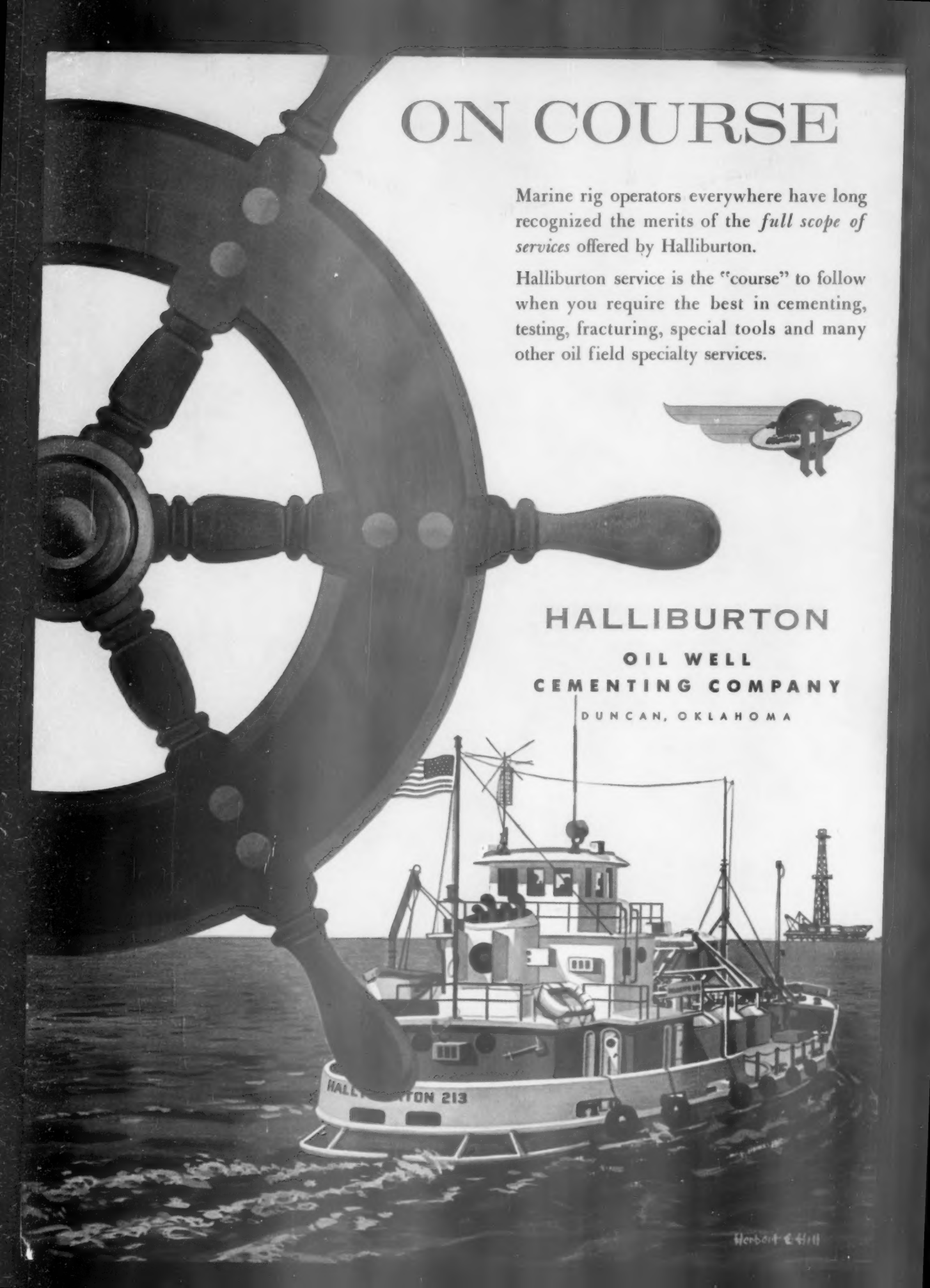
Cities Service saves $41,000 on unloading dock ▸ 68

BP studies Middle East cat cracker feed stocks ▸ 70

How Oil Is Spending Its Money in '60

Marketing is taking a bigger bite out of the capital budget, which this year will top '59 by $500 million

▸ 39


ON COURSE
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OIL AND GAS JOURNAL
Vol. 58 No. 9

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TECHNOLOGY—OPERATION

Gas-Processing

Movable LPG Unloading Dock Saves $41,000 68
By Roger Stark and R. D. Crow
New installation provides for winching barges against the river bank. Movable dock is winched up and down the river bank as the river rises or falls. Cost totals $9,000 as compared to more than $50,000 for the sparred barge method.

Refining

Cat Cracker Feed Stocks from Middle East Crudes 70
By R. J. H. Gilbert and W. N. N. Wright
Studies carried out in a pilot reactor and six catalytic cracking units on Middle East gas oils for the past several years show: (1) feed pre-heat and reactor temperature are main operating variables affecting product distribution; (2) recycle ratio is significant only if it permits high conversion; and (3) hydrofining feed stocks gives better cracked gasoline quality.

Computer Control Reduces Costs, Improves Quality 87

California Oil Co. Saves on Cooling Tower 93
By Joseph J. Finnerty
The company uses a 15,000-g.p.m. salt-water induced-draft counterflow unit at its Perth Amboy, N. J., refinery. Operation has been very successful.

Questions on Technology 96
Do other countries have depletion allowance? What temperatures do asphalt-handling operations require?

Petrochemical

New Catalyst for Making Ethylbenzene 80
By Edwin K. Jones
This new solid phosphoric acid catalyst has higher activity toward the primary alkylation reaction and lower activity toward the undesirable polymerization side reaction.

Vickers Udex Unit Has Lowest Operating Costs 91
By Gordon D. Kerns
High-purity BTX recoveries run 95% and higher, and recovery of solvent-grade heavy aromatics is consistently 70% and higher. Annual maintenance cost is about 0.05% of investment.

Production

Oil-Emulsion Muds Can Lead to Log-Interpretation Errors 66
By Norman Lamont
Inaccurate determination of electrical properties of mud, mud filtrate, and mud cake can introduce errors that will give false porosity and saturation answers. Here are some suggestions to follow if your log interpretation is to become more reliable.

Drilling

How to Reduce Drilling Costs—Part 2 81
By Preston L. Moore
The basic factors which affect hole costs are supervision, engineering, rig-up-and-down time, rotating time, round trips, cost of drilling fluid and mud conditioning time, formation evaluation time, waiting on cement time, hole trouble, casing size, and cement materials. Here are brief evaluations of these factors.

Pipelining

Computer Speeds M.c.f.-Mile Study 76
By Roy Adams and F. M. Jessup
This M.c.f.-mile program is in use and is available through Southern Natural Gas. It serves its purpose well. It is not proposed as a blanket-type solution, but could be readily adapted to transmission companies in general.

Pipeline Construction Report 97

The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Feb. 29, 1960

Refiners finally have started to cut runs:

The failure or refiners to throttle down runs earlier plus the warm winter of 1959-60 have caused trouble throughout the industry.

One economist estimates about one-third of the blame lies with the weather and two-thirds with refiners (p. 48)*.

High stocks have led to price cuts in distillates. Now refinery cutbacks will make themselves felt in lowered crude production.

Big aim of cutbacks by Indiana Standard, Continental, Phillips, DX-Sunray, and others is to prevent a gasoline glut before the motoring season starts.

Gasoline inventories are in reasonably good shape. If they should build up too fast and depress gasoline prices, refiners and the rest of the industry would be in trouble for the rest of the year.

On the price front: No. 2 is weaker on the East Coast, ditto in the Mid-Continent. Gasoline is firmer in the Mid-Continent, but the spread is being narrowed on the Gulf Coast between regular and premium.

▼ ▼ ▼

Final 1960 capital spending budgets give the oil industry a vote of confidence (p. 39).

Operators are on their way to spending $6.7 billion during the year, an 8% gain over the $6.2 billion spent last year.

Every branch shows a gain. The breakdown:

...Drilling and production $4.1 billion.
...Pipelining $1.1 billion.
...Manufacturing $675 million.
...Marketing $508 million.

▼ ▼ ▼

Rotary-rig activity is improving slowly.

Number of rigs working in the U. S. last week totaled 1,683 compared with 1,618 the week before.

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*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

That's part of the way out of the doldrums but still far below the 1,861 reported for the same week last year. Peak activity last year came near the end of June when total rigs active reached 2,284.

Canadian drillers are the busiest they've been in 3 years. Continued cold weather is helping operators in their rush to complete winter programs before the spring breakup.

Active rigs last week hit peak of 271 with 130 on field wells and 141 on wildcats.

Another oil operator has joined the many who have dropped company-owned drilling tools and plan to contract their drilling in the future.

McAlester Fuel Co. sold its three rigs which had been working in the Permian basin. Buyer was Forster Drilling Co. of Odessa.

▼ ▼ ▼

Oil operators proved their faith in offshore areas by planking down $284.5 million last week for new acreage in Louisiana and Texas Gulf Coast leases (p. 42).

The bonus total was a record. Average bid per acre, however, was slightly less than past sales. The average on some 750,000 acres leased was $379.48.

Total high bids for 240,480 acres off Texas was $35.7 million and for 511,024 acres off Louisiana $249 million.

Texas offshore area is enjoying a flurry of drilling. Three wildcats give it the busiest look in several years.

Standard of Texas will drill to 11,000 ft. 30 miles northeast of Galveston off Jefferson County at A-2 Federal 52 SW, located on 1,440 acres in Tract 52. Nearest production is 3,520 ft. northwest at 1 Federal 52, the only oil find of last year in offshore waters of Gulf Coast District 3.

Texaco's 1 State Tract 219-S will go to 10,500 ft. 3 miles east of Galveston off Galveston County on Tract 219. Nearest production is 9 miles southeast in GAB 189 field.

Gulf's 1 Texas State Lease 50802 in the Brazos area, 10 miles southwest of Sargent and a mile northeast of Kain field, will be an 8,000-ft. Miocene test.

Phillips and ODECO have completed offshore deal.

ODECO will earn an interest in 3,800 acres, 10 producing wells, 2 production platforms in Block 129A, Eugene Island area, off Louisiana, by making a certain driling investment.

Deal works two ways: Gives Phillips a partner in developing the block and gives ODECO offshore production plus a chance for more (p. 41).

Other big deals: General American has paid John Mecom

$27 million for part of his holdings and is a half partner in the $46.5-million purchase of the Joe W. Brown Estate's oil holdings in Louisiana (p. 56).

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Exploration notes:

Shell purchase in northeastern part of Paradox confirms reports of hot leasing play following Pure Lisbon discoveries. Shell bought 88,000 acres from Penrose & Tatum for $24 per acre plus 5% override. Land is mostly in western Colorado.

Nebraska's best Denver basin hit in years is the Wyoming Western Oil 1 Hoffman in Kimball County, completed for a pump gage of 600 bbl. daily.

Arizona drilling should step up sharply this year. Texas Pacific Coal & Oil has made location for stepout to its Apache County discovery. Look for some big activity in northeastern part of state, however.

South Dakota is taking more of the spotlight in Williston basin. Forecast calls for 1960 to be better even than 1959. Look for a gradual shift of wildcatting to the east and southeast in coming months.

Imperial has a promising significant strike at Goose River, 35 miles west of Swan Hills (p. 55).

Abroad: Russia has makings of a major discovery in the Caspian Sea region north of old Baku. Wildcat encountered a prolific zone at 10,700 ft. after overcoming difficult drilling conditions that had held up exploration for years... Second wildcat will be spudded on Timor by Tradewind Exploration, Inc., of Denver, and its partner Timor Oil, Ltd. Crews are awaiting end of monsoon season in April in area north of Australia...Oil strike for Australia may follow recent discovery of gas at Port Campbell. Seismic work is given credit for the hit. Some observers believe the first well may have pierced the gas cap of a real oil trap.

▼ ▼ ▼

New system leaving producing wells unattended 1 day a week plus the 8 generally recognized holidays a year is saving oil companies plenty in gager, pumper, and transportation costs.

It is effective in fields not automated. It has not hurt safety nor producing efficiency. A few operators are extending idea to cover 2 days weekly.

Biggest benefit: Economic limits of many leases are extended indefinitely by the lowered costs (p. 46).

An unconventional new packer is cutting the cost of completing multizone, slim-hole wells in Louisiana and Arkansas.

The free packer, now being patented by Pan American Petroleum, is simply dropped down the casing, setting it-

self in the proper position. It has been used so far in combination perforating and fracturing (p. 50).

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Language of ruling in 29-company conspiracy case has been strengthened by U. S. District Judge Royce Savage.

The judge, in editing the court reporter's transcript of his oral decision, removed a "perhaps" that had worried defense attorneys.

In discussing the corporate-family situation, Judge Savage had said: "...I think I should go no further than to say that perhaps it is my view that the mere approval by a parent corporation of the price schedules and pricing policies inaugurated and fixed by the subsidiary corporation does not constitute a per se violation of the Sherman Act..."

Company lawyers felt the "perhaps" would give them some trouble in the future. Last week corrected copies of the transcript were made available by the court reporters. The "perhaps" was missing.

▼ ▼ ▼

Big changes are coming in tomorrow's refinery.

Isomerization may open up major advance, Socony's director of research tells ASC Petroleum symposium.

Backbone of tomorrow's plant will be catalytic reformer, says DuPont's planning manager for petroleum chemicals. He says refiners also will rely on alkylation and isocracking, especially if reduced sensitivity is desired (p. 54).

New refinery in Tunisia apparently will be built by group of private companies which won out in contest with the Italian ENI.

Reports from Tunis say the government is about to sign an agreement with Royal Dutch-Shell, Petrofina, Mobil, and Jersey Standard for 10,000-bbl. plant at La Goulette. Feed will be taken from pipeline being built from Edjele.

A brand new language—prolan—has been developed by Socony Mobil's mathematicians to give instructions to electronic computers.

Prolan, based on the specialized vocabulary of refinery engineers, may cut the high cost of programing by as much as 80% (p. 51).

Government hopes to stimulate sales of oil field equipment abroad.

It will ask representatives of the industry to attend a meeting in Washington, tentatively planned for late June, to get industry suggestions on how the Government can be of help.

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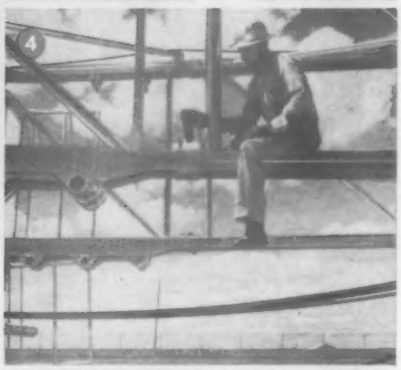

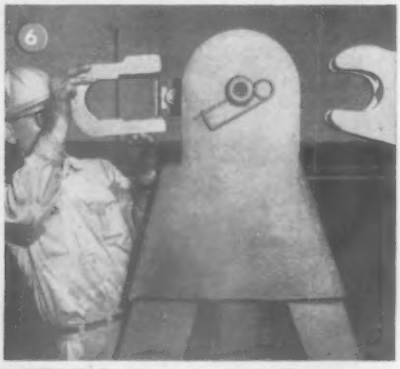

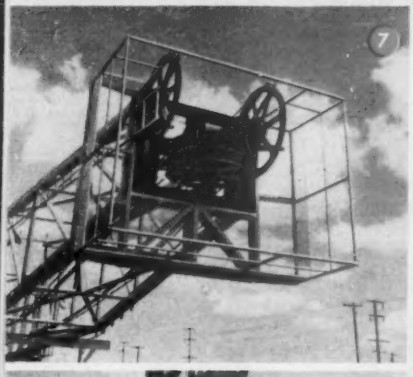

SEE ... how exclusive features cut rig-up time on

"Oilwell" Lever-Lift Masts

1. The mast consists of five sections, which nest together on three trucks as shown. With substructure it moves anywhere in five truck loads.

2. When outside substructure sub-bases are unloaded on location, swaged pipe spacers drop easily into place and top spacer beams, with patented wedge-lock fasteners, snug beams and columns together.

3. The mast hinge frame atop the substructure is held securely in position by threaded tee-fasteners, self-contained in the upright columns of the substructure.

4. Patented mast-leg-lock connectors are used instead of bolts in assembling the mast sections at ground level. Leaf spring with nut handle holds each wedge securely in place.

5. Eccentric hinge pins (patent pending) pivot the tubular raising levers from the base corners of the substructure and keeper pins engage to maintain desired position.

6. Hinge pins atop the substructure are positioned in front of the draw works to provide over 480 sq. ft. of safe working space for the crew. The forked end of the mast moves into position under draw works power, and is secured by U-shaped fastener with locking bolt and nut.

7. Patented cross-over crown block runs the fast line and dead line outside the mast, equalizing leg loads and minimizing torsional strain. This arrangement also positions the traveling block with flat side facing and fast line away from the derrick man.

8. Patented raising system minimizes fast line pull from the draw works. Lifting levers (which become front legs) actually push the mast into upright position where an automatic spring-loaded wedge-lock, with over-travel stop, prevents the mast from being pulled over backward or falling forward. This lock must be released by hand before mast can be lowered.

9. The mast is quickly centered over the well by adjusting hinge pins in the two mast legs and the two lever legs. One man turns the eccentric pin while the other inserts a keeper at the desired position.

10. Owners agree that Lever-Lift Masts load and unload fast . . . go together fast . . . and tear down fast. They're designed to save you time and money. Contact your nearest "Oilwell" or Wilson Supply Company representative for the full story . . . or write for information.

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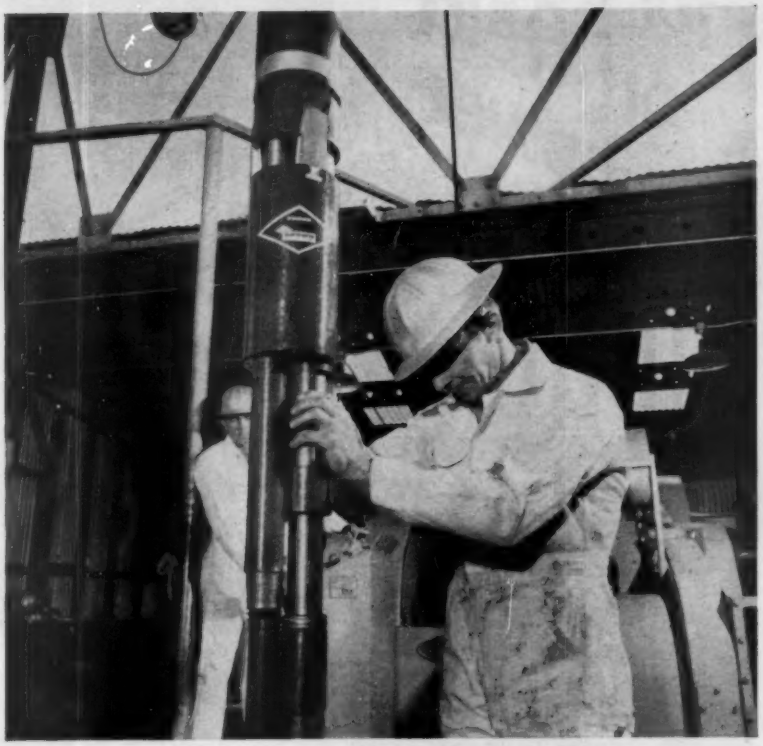

NEW TUBING PACKER USES HYCAR

to permit multiple zone completion

Type HS-8 hydraulic-set, retrievable multi-zone tubing packers are made by Brown Oil Tools, Inc., Houston, Texas. Hycar seals are molded by Murray Rubber Company and Houston Rubber Company, both of Houston. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.

A new multiple zone tubing packer incorporating Hycar nitrile rubber has already proved itself in many multiple zone completions. As many as four pay zones in a single well have been tapped with the unit.

Requirements were tough. Very little space is available, especially when as many as four tubing strings run through a single seal. Many materials were tested — even soft metal. However, engineers who selected Hycar made this statement: "Hycar 1072 provides a completely dependable seal, standing up under elevated pressures better than any other rubber."

In addition, Hycar withstands constant exposure to well fluids such as sweet and sour crude, distillate, methane gas, salt water and drilling chemicals — fluids that would kill ordinary rubber. You can get more information about how Hycar solves tough oil field operating problems by writing Dept. FH-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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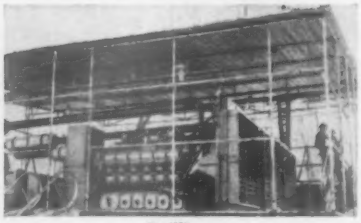
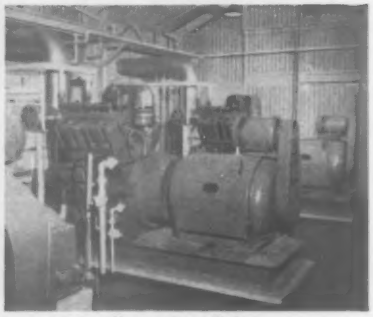
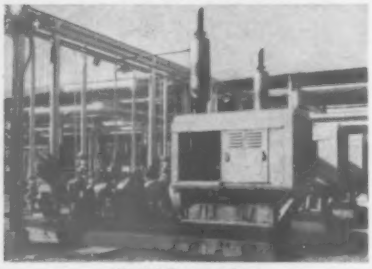

Drilling


Generator Drive

Pipe Line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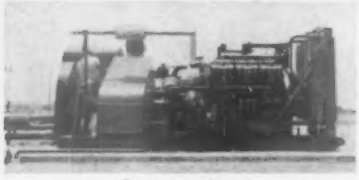
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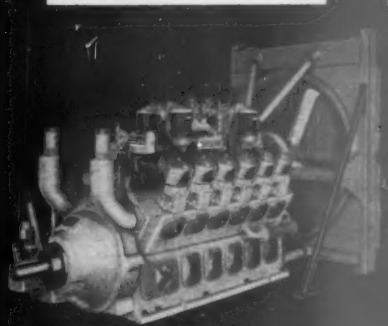
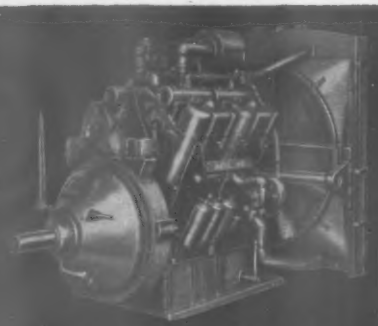

L-4000—12-cyl., 706 hp


H-2000—8-cyl., 300 hp

F-1500—6-cyl., 230 hp

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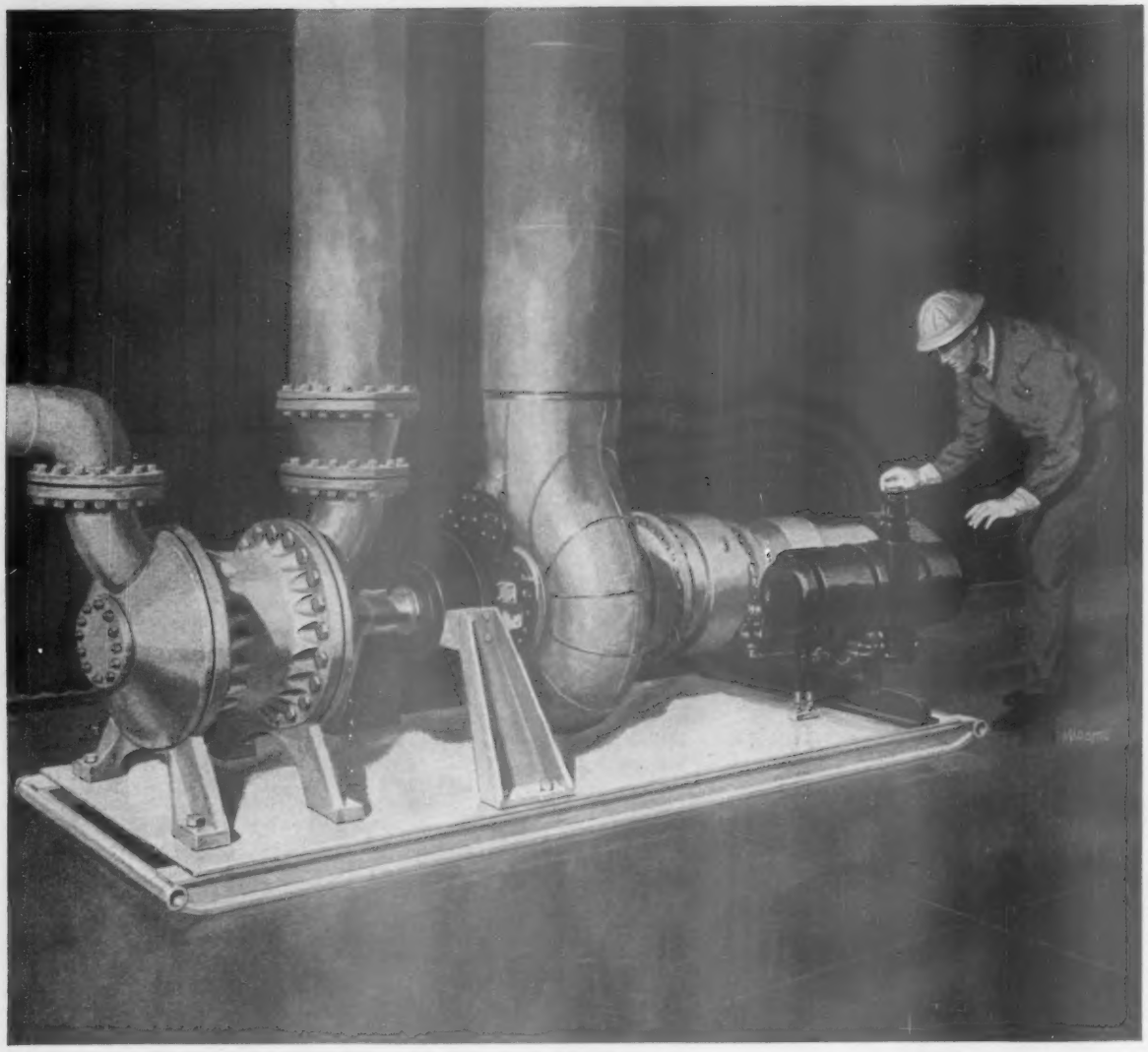

UNIQUE NEW COMPRESSOR

Solar industrial gas turbine-driven centrifugal compressor offers advantages found in no other type

SOLAR'S LIGHTWEIGHT centrifugal compressors incorporate unique new features for applications in the low-volume range. They operate in a range of flows and pressures new to centrifugal equipment. Interchangeable compressor wheels and other parts permit quick, low-cost field changes to accommodate new flow and pressure requirements. Ideal for main pipeline stations as well as field use, they can be started or shut down in seconds—even by remote control—and are ideal for unattended operation.

Designed to match the high rotating speeds of Solar gas turbine drivers, Solar's new compressor packages are small and lightweight (a fraction of the weight of conventional piston-driven units). They require only the lightest foundations. Maintenance is simple. Easy portability allows periodic inspection at a central shop.

A new illustrated brochure describes in detail Solar centrifugal gas compressors. Write for it to Dept. G-194, Solar Aircraft Company, San Diego 12, California.

See Solar's gas turbine industrial compressor at the ASME gas turbine conference in Houston, March 6-9.

SOLAR
AIRCRAFT COMPANY

MID-CONTINENT COVERS THE OIL COUNTRY WITH RIG PARTS AND SERVICE CENTERS

To assure available field service for Mid-Continent drilling equipment, Mid-Continent now offers the industry strategically located service centers stocked with genuine Mid-Continent rig parts . . . parts guaranteed against defects in material and workmanship. This vast network of service centers, staffed with competent, factory-trained personnel, stands ready to make repairs 24 hours a day, with top priority for emergency breakdowns. In most cases, repairs are made on location—which means less rig shutdown time. Yes, whenever . . . or wherever . . . you need Mid-Continent parts or service, call your nearest Mid-Continent service or sales representative.

MID-CONTINENT—SUPERMARKET FOR THE OIL INDUSTRY

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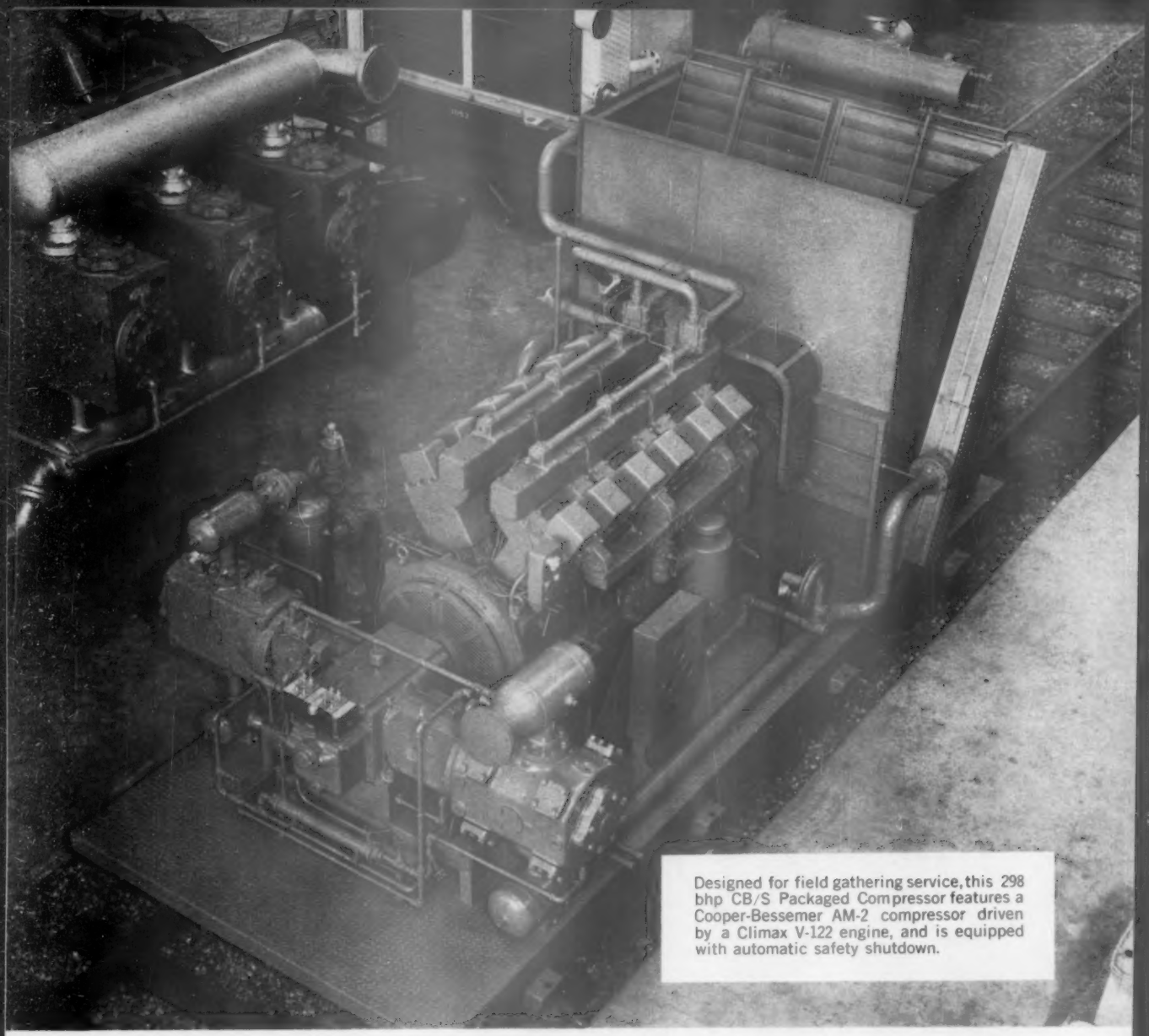

Designed for field gathering service, this 298 bhp CB/S Packaged Compressor features a Cooper-Bessemer AM-2 compressor driven by a Climax V-122 engine, and is equipped with automatic safety shutdown.

Building packaged compressors is our business . . . our only business. This single objective is the reason CB/S Packaged Compressors are more advanced in design . . . more efficient in the field.

CB/S
PACKAGED
COMPRESSORS

CB/S

C-B SOUTHERN, INC., P. O. BOX 19267, HOUSTON 24, TEXAS

A subsidiary of The Cooper-Bessemer Corporation.

New Nalco Coagulant makes Larger, Heavier Floc . . . Faster

Radically different Nalcolyte 110 used with Conventional Chemicals to Cut Costs, Speed Action in Water Clarification

Photo taken in Nalco Laboratories 7 seconds after agitation stopped: *Left*, Control sample of untreated turbid water; *center*, same water, treated with 50 ppm alum; *right*, same water, treated with 20 ppm alum, 1 ppm Nalcolyte 110. Note that large, dense floc is settling out much more rapidly than center alum-treated sample.

Nalcolyte 110 is a new, non-ionic high polymer flocculant of very high molecular weight—over 1,000,000. It is used in extremely small dosages with conventional coagulants (such as sodium aluminate, alum, ferric sulfate) to increase size, density and uniformity of floc.

Less Chemical; Greater Capacity

Action of Nalcolyte 110 in creating heavier, larger, faster-settling floc not only permits greater throughput rates without floc carryover to processing equipment, but also cuts the total chemical requirements at a resultant cost saving.

In the example illustrated above, only 40% as much alum is required when Nalcolyte 110 is used.

May be Used in Potable Waters

Approved by the U. S. Public Health Service Technical Advisory Committee for use in treatment of public water supplies, Nalcolyte 110 gives water works the opportunity to get appreciably greater capacity from existing clarification equipment—at lower treating cost.

High Suspended Solids No Problem

Waters containing high suspended solids respond quickly to Nalcolyte 110 coagulating action . . . frequently without other coagulant chemicals.

Typical high suspended solids waters which can be treated with speed and economy with Nalcolyte 110 are paper mill white water systems, industrial waste waters, mineral slurries and blast furnace gas wash water slurries.

Nalcolyte 110 Easy to Handle

Nalcolyte 110 is a coarse, white, free-flowing powder of non-toxic character. It is fed in dilute water solutions with standard liquid proportioning pumps or feeders. Stock solutions are prepared at concentrations up to 20%. Packaging is in convenient 25-lb. bags.

Data Available Promptly

Full information on Nalcolyte 110 for your coagulant use is ready to be sent upon your request. Write today, or call your Nalco Representative.

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Nalco CHEMICALS

Engineering Progress Report

FROM UNION CARBIDE CHEMICALS COMPANY

REDUCE GAS-SWEETENING COSTS

Two simple control tests increase plant efficiencies

Chemical analysis is the only quick and efficient method of gauging the operating efficiencies of plants that use monoethanolamine to sweeten natural gas. By proper interpretation of the simple, yet accurate tests, plants can be operated more efficiently and at some cost saving.

Quick titrations can give this information and enable the plant operator to keep safely below solution overloading, thus minimizing corrosion and solution contamination.

TEST NO. 1—ACID GAS CONCENTRATION

The total acid gas content of both the rich and the regenerated lean solutions is determined by simple titration. By comparing the acid gas contents of these solutions, before and after regeneration, the regeneration efficiency and the net solution loading can be determined. This net solution loading (the amount of acid gas removed by the solution) should check with an acid gas material balance around the absorber.

An excess of acid gas in both the rich and lean solution indicates solution overloading or improper regeneration.

When the rich solution loading is high, while the lean solution loading is quite modest (here indicating good regeneration), one of three things may be at fault: (1) Insufficient scrubber fluid circulation; (2) Insufficient amine concentration; (3) either more gas is being processed than anticipated, or the acid gas content is higher than originally expected.

An excess of acid gas in the lean solution, when the rich solution is not overloaded, indicates improper regeneration or severe solution contamination.

STEAM REQUIREMENTS FOR REGENERATION

Enough stripping vapor should be provided to the regeneration column to remove essentially all the acid gas from the rich solution before it enters the reboiler. Normal steam rates vary between 0.8 and 1.2 pounds of steam per gallon of amine solution circulated.

FLUID CIRCULATION

In plants with all carbon steel equipment the amine solution circulation rate should be adequate to keep the net solution loading at or below 0.4 moles of total acid gas (CO_2+H_2S) per mole of monoethanolamine. Under these conditions, in the conventional plant, the rich solution will contain less than 0.5 moles of total acid gas per mole of amine; and the lean solution will contain 0.1 or less moles of total acid gas per mole of amine.

Contamination can be controlled by a side stream distillation unit that removes foreign materials and amine degradation products.

TEST NO. 2—MONOETHANOLAMINE CONCENTRATION

By titrating a sample of the lean solution with standard HCl, to a pH of 4.5, the per cent of monoethanolamine free for acid gas absorbtion can be determined. This information allows for proper control of amine concentration and, therefore, proper setting of the circulation rate.

OTHER TESTS

Union Carbide has for many years maintained laboratories for the examination of scrubber solutions, and for basic research in gas treating technology. These are two of many analytical tests described in the paper "An Approach to Monoethanolamine Solution Control: Chemical Analysis and Its Interpretation." This paper relates chemical analysis to plant operation and suggests remedial steps found effective in eliminating operational difficulties. For a copy, use the coupon provided.

UNION CARBIDE is a registered trade mark of Union Carbide Corporation.

UNION CARBIDE CHEMICALS COMPANY
Dept. G, 30 East 42nd Street, New York 17, New York

PLEASE . . .

- ☐ Send a copy of the paper—*Amine Solution Control.*
- ☐ Have a representative call.
- ☐ Send me information on_____

Name_____ Position_____

Company_____

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City_____ Zone_____ State_____

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In San Francisco, California... or the Ivory Coast of Africa..

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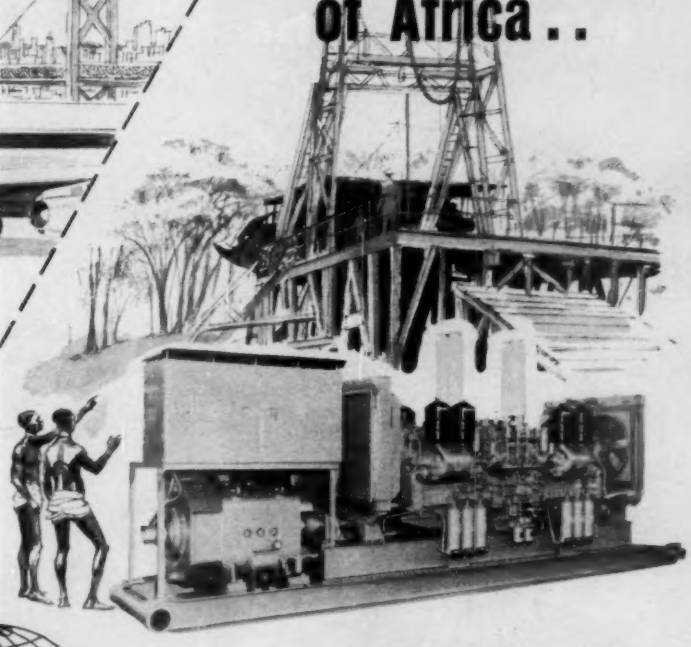

Stewart & Stevenson RIGELECTRIC engine electric power unit supplying power for drilling operations on Laughlin Porter's oil drilling rig in Africa.

When it comes to diesel or gas engine power, Stewart & Stevenson experience and "know-how" have no boundaries.

Here again are two diesel engine power applications . . . in direct contrast and in opposite parts of the world . . . with one important characteristic in common: both were designed and built by Stewart & Stevenson Services, the world's largest distributor of diesel engines. Both power applications are serving vital industries where thousands of dollars and valuable contracts are totally dependent on the reliability and performance of this engine driven equipment.

When you need power . . . for any application in any part of the world . . . Stewart & Stevenson's experience, service organization and engineering will guarantee dependable performance. We will be glad to study your power needs and submit recommendations. Please write for additional information.

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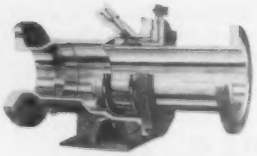
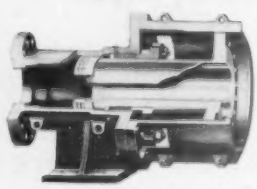


RAM-PAK



SLIP TYPE

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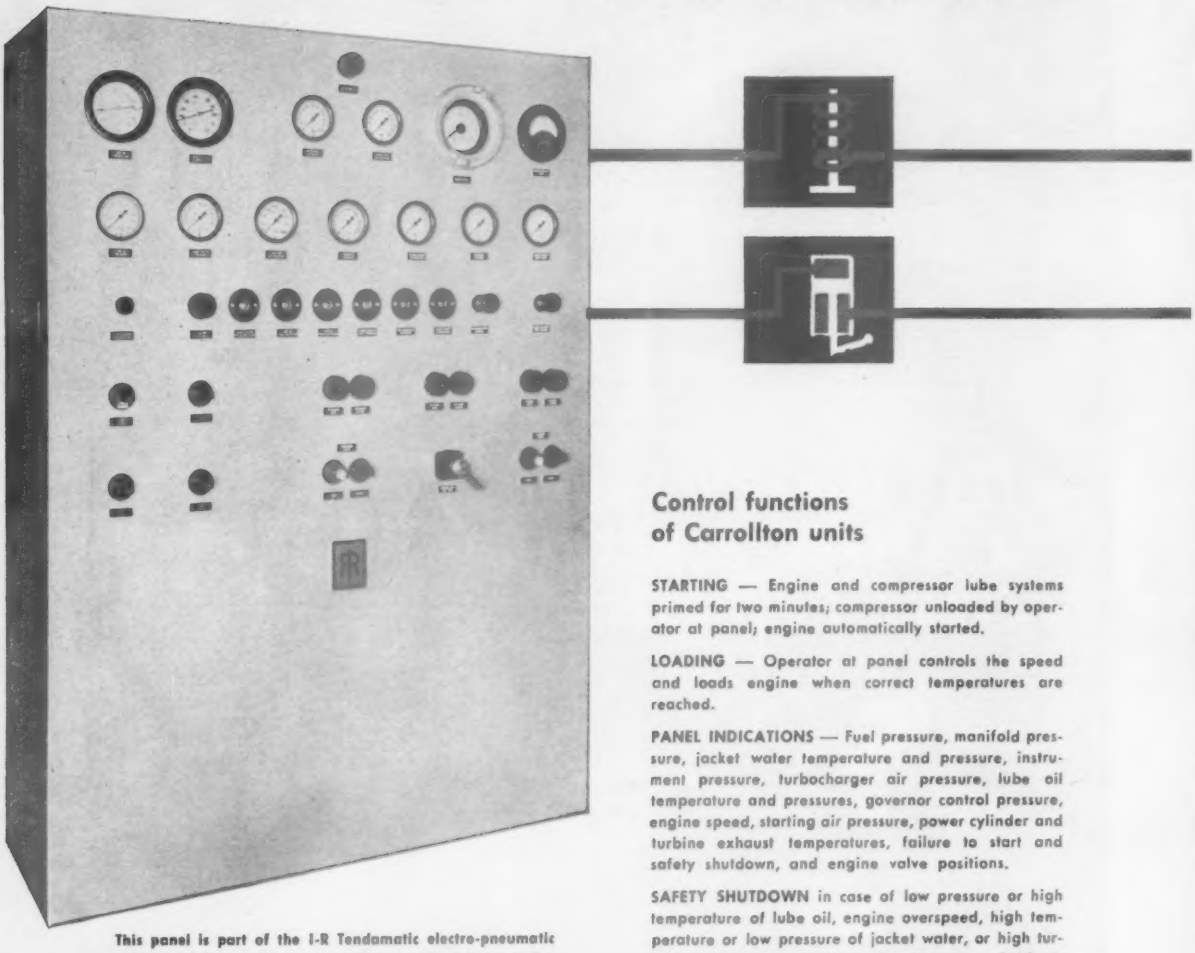
NEW Tendamatic®

ELECTRO-PNEUMATIC



This panel is part of the I-R Tendamatic electro-pneumatic system which provides automatic control and protection of KVS gas-engine compressors at the Carrollton station.

Control functions of Carrollton units

STARTING — Engine and compressor lube systems primed for two minutes; compressor unloaded by operator at panel; engine automatically started.

LOADING — Operator at panel controls the speed and loads engine when correct temperatures are reached.

PANEL INDICATIONS — Fuel pressure, manifold pressure, jacket water temperature and pressure, instrument pressure, turbocharger air pressure, lube oil temperature and pressures, governor control pressure, engine speed, starting air pressure, power cylinder and turbine exhaust temperatures, failure to start and safety shutdown, and engine valve positions.

SAFETY SHUTDOWN in case of low pressure or high temperature of lube oil, engine overspeed, high temperature or low pressure of jacket water, or high turbine exhaust temperature. If emergency shutdown occurs, horn sounds and pneumatic indicators show reason at panel; fuel gas is shut off and later ignition is grounded.

NORMAL SHUTDOWN — Operator at panel actuates automatic sequence which unloads, slows and stops unit. Lube system runs for two minutes longer.

PIPELINE COMPANY...

compressor control features operation

for convenience and economy in starting and normal shutdown sequence control

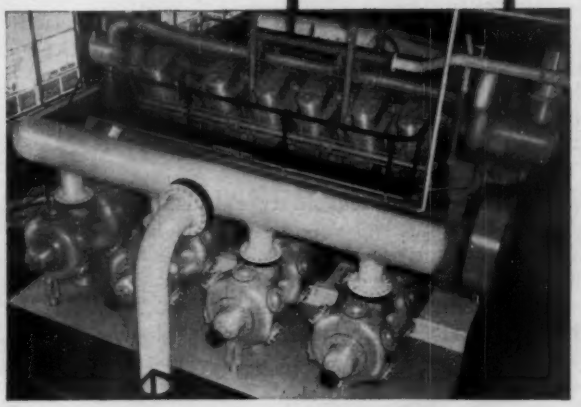
for safety and dependability in normal running and emergency shutdown control

At the Carrollton, Ohio, station of Tennessee Gas Pipeline Company, a division of Tennessee Gas Transmission Company, four 2000-hp Ingersoll-Rand KVS gas-engine compressors are operating under the constant vigil of a new achievement in automatic control systems.

This new I-R Tendamatic control installation combines the advantages of both electric and pneumatic operation in a single automatic control and protection system. Engine startup and normal shutdown are accomplished by electrical sequence control, permitting the use of compact electric timers, relays, etc. Once the compressor is loaded and on the line, the pneumatic system takes over the job of monitoring, indication and automatic emergency shutdown.

Therefore, the control and protection of the engine-compressors are independent of the electrical system, and a power failure would have no effect on successful operation.

Tendamatic systems can be supplied to meet any requirements — for remote, semi-remote, local, microwave, two-wire, multiple-wire, electric, pneumatic or hydraulic operation or in combinations. For more information, call your I-R representative.



Ingersoll-Rand 2000-hp KVS 4-cycle, V-angle engine-compressors at the TGP Carrollton station.

Only I-R compressors have Tendamatic control

Ingersoll-Rand

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Now you can do well servicing and completion work better than ever with Guiberson's J2 Drilling Head that has a built-in, compact rotary table. Twenty-one new features have been built into this husky head. All designed for longer life..easier maintenance..faster, more profitable jobs for you.

USE IT FOR REVERSE OR CONVENTIONAL CIRCULATION. For your drilling or servicing work set-up the J2 head either way. Then circulation can be changed back-and-forth at will for faster, more economical cleanout.

USE IT FOR GAS OR AIR DRILLING. The new type wash pipe is designed for continuous drilling. An advantage you can use to complete jobs faster..more economically.

USE IT FOR SLIM-HOLE DRILLING. You'll like the unitized slips for one-man operation..more pipe holding strength..easier on your tubing. Plus the heat-treated kelly drive bushings for longer wear.

ADDITIONAL FEATURES. Heavy-duty spindle..retainer ring takes spindle load..wash pipe hardened *throughout*, not just case hardened..wash pipe packing replaceable in field..two lubricated dust seals protect bearings and gear..strong lifting eye hooks, cast integral with body..fast, easy rubber tightening with 3 studs..quick detaching top for easy rubber removal.

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HEAD WITH SLIPS AROUND TUBING

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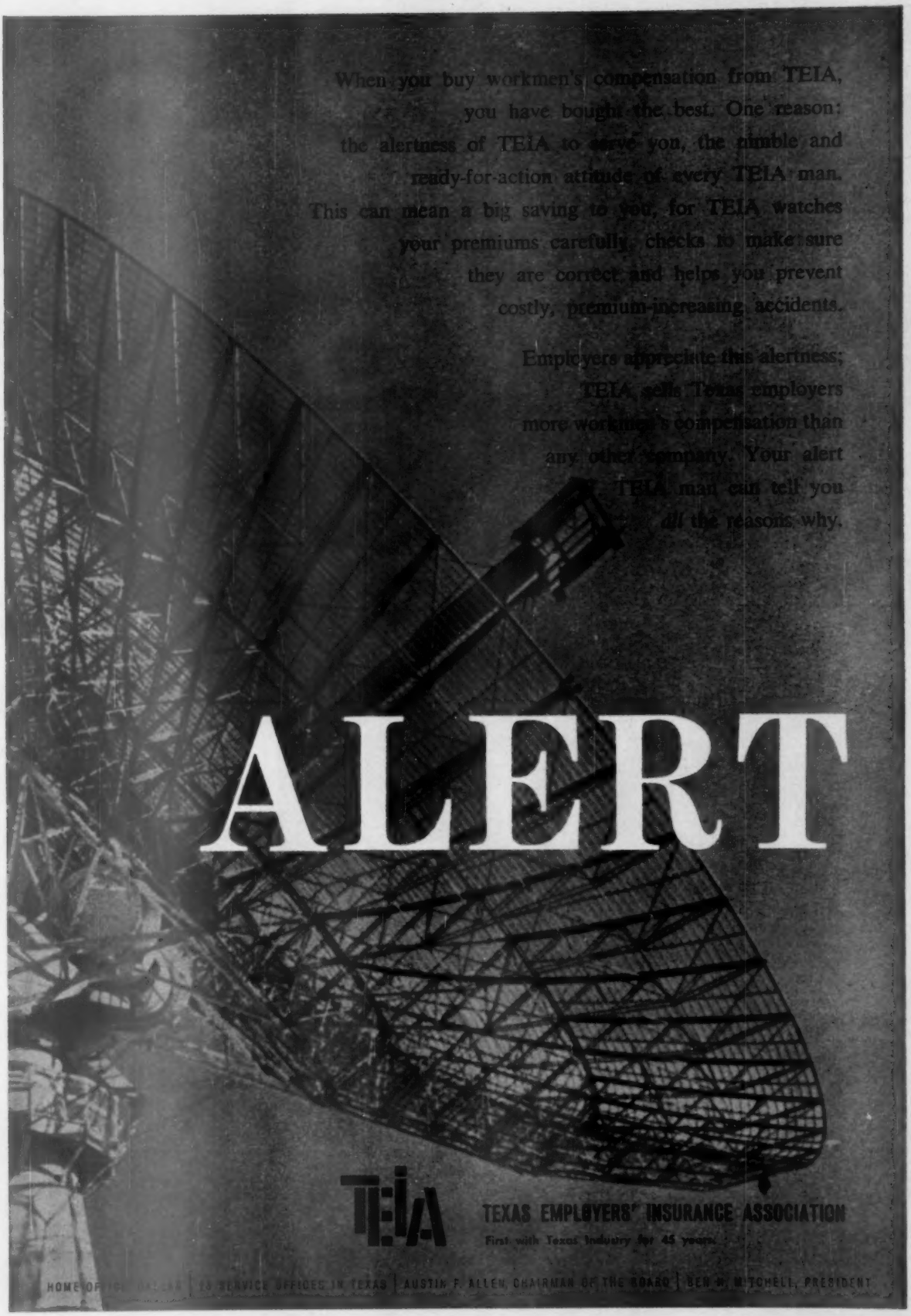
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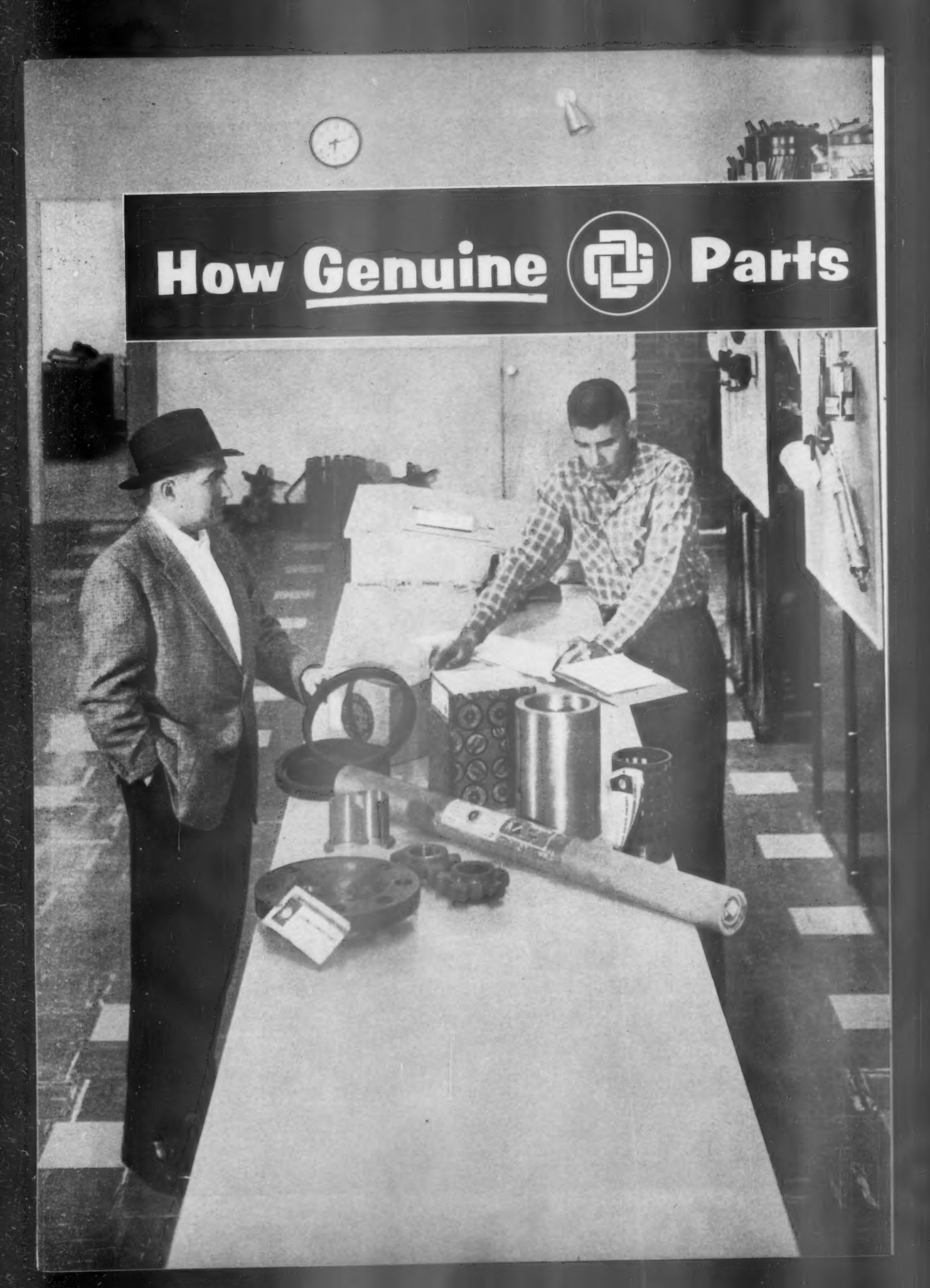
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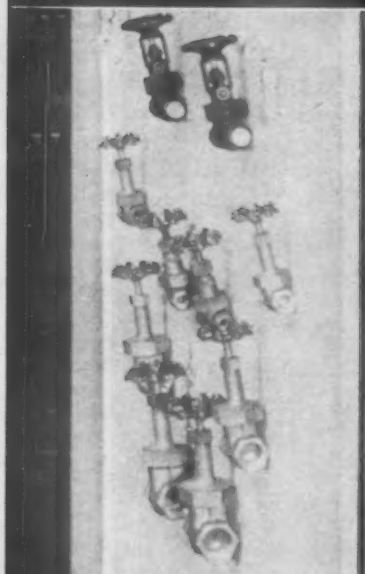

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- Insure long trouble-free service.
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These parts will protect your investment in superior performance.

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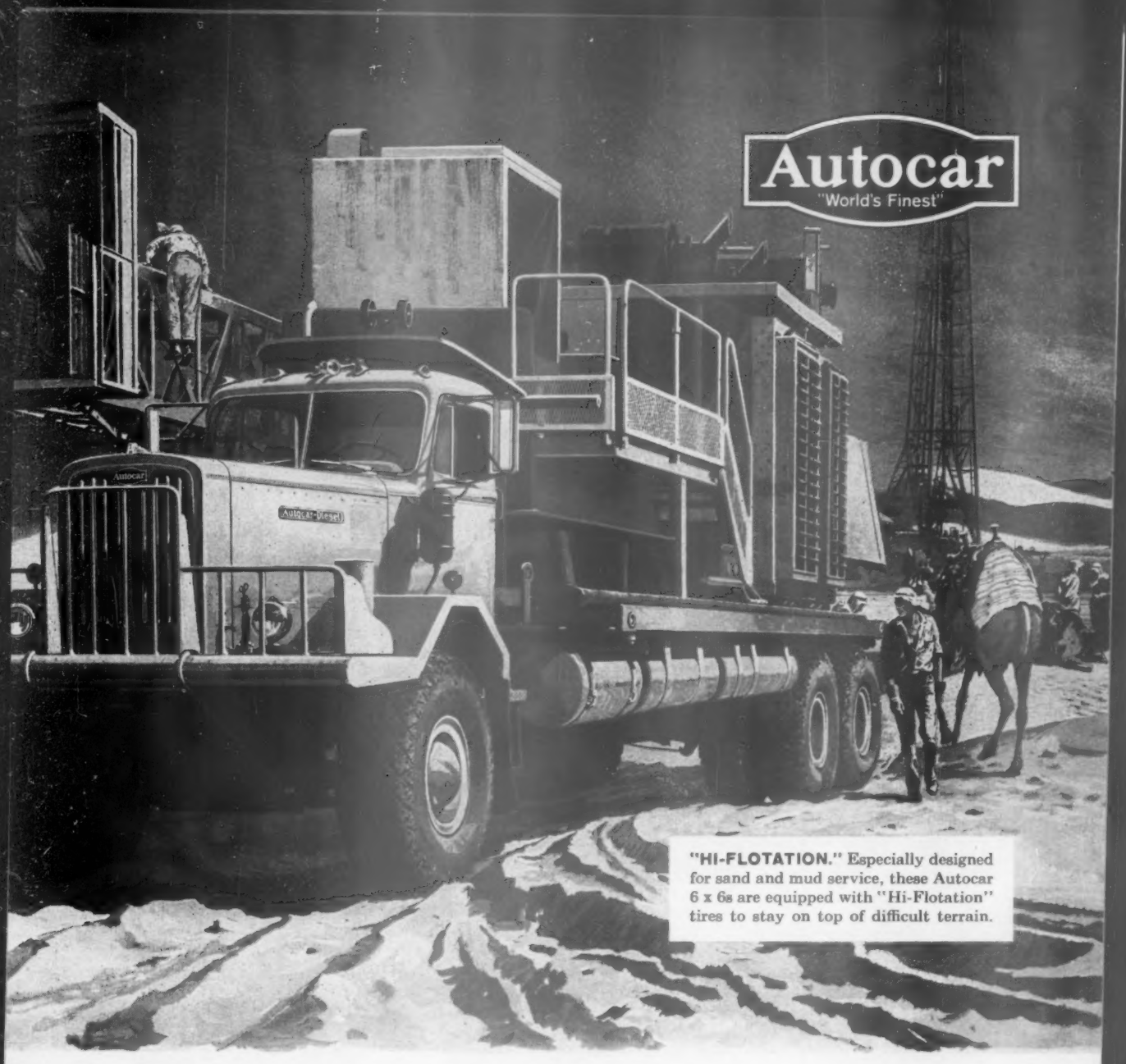

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This Autocar is a six-wheel-drive unit with special "Hi-Flotation" tires — each one making a footprint of more than 200 square inches. It hauls draw works, pumps, derricks and power plants deep into the desert. Autocar stands up under the most grueling punishment—yet its life will be long and trouble-free. No wonder oilmen all over the world say, "Send us Autocar, nothing less."

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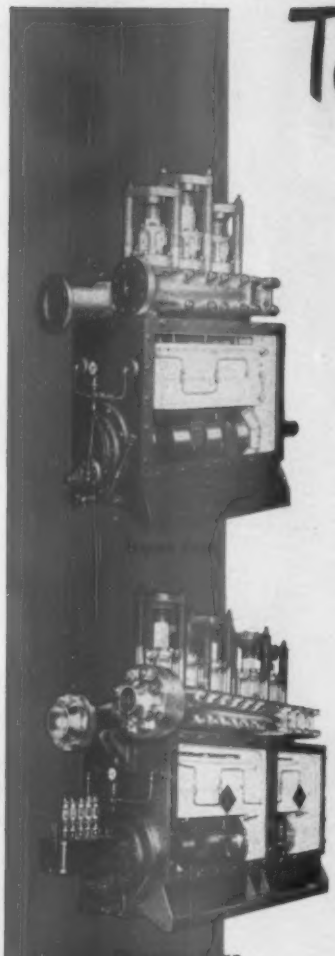
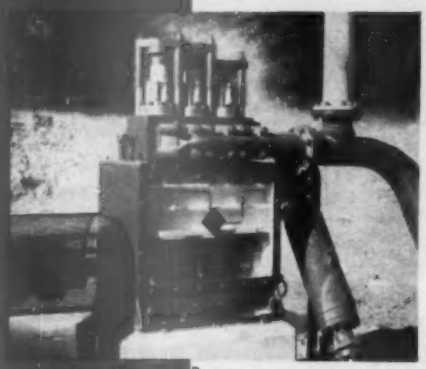
A FULL DOLLAR'S VALUE FROM AJAX *Equipment*





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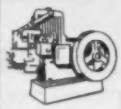
You can trust Ajax VALUE . . . you can trust AJAX EQUIPMENT — today, tomorrow—and always.

AJAX

AJAX OIL FIELD PUMPS



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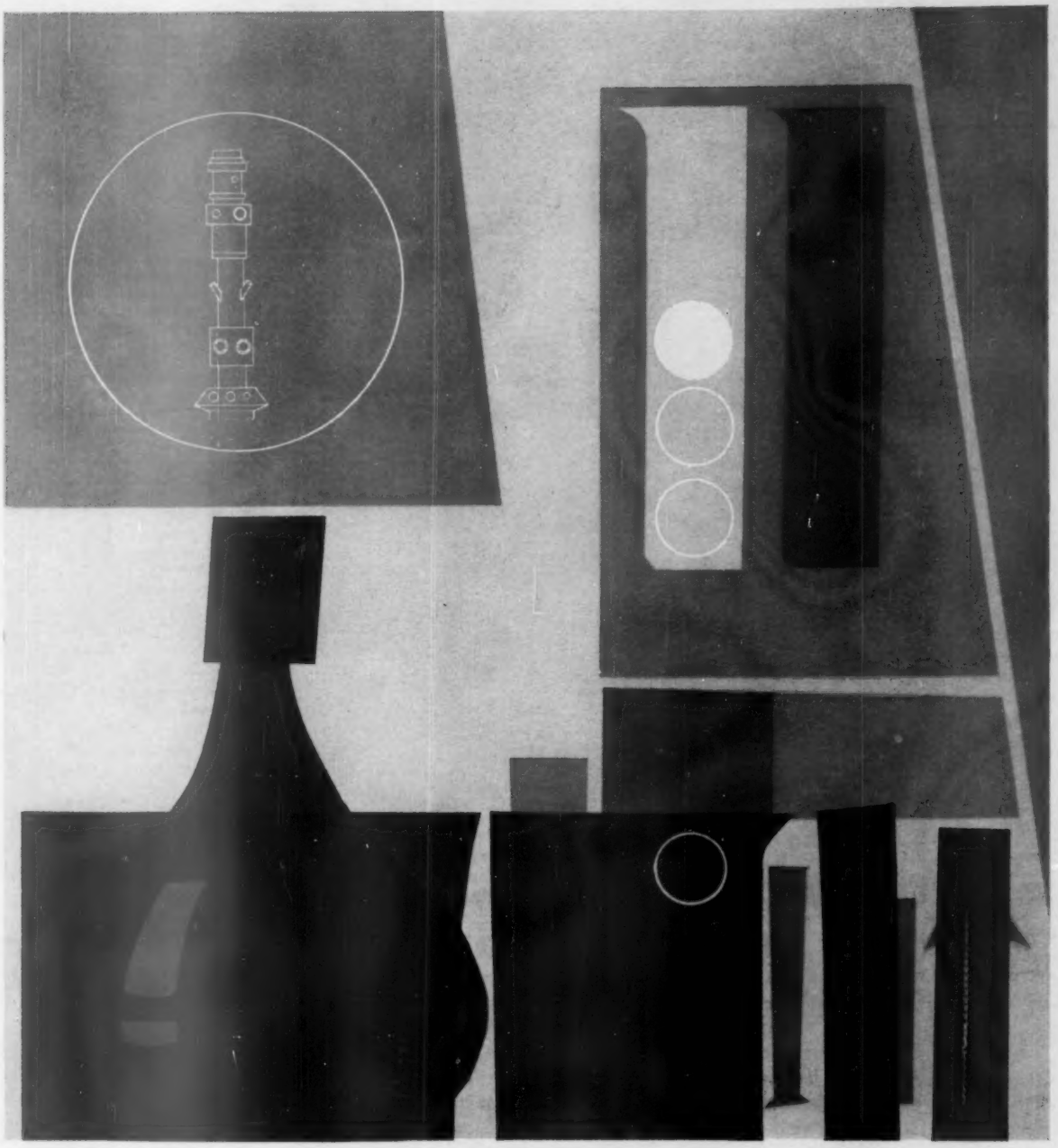

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Out in East St. Louis stands the birthplace of new products and product improvements affecting nearly every American industry. There, you'll find ALCOA operates the only fully equipped laboratory facility devoted to the constant development of new forms, grades and uses for alumina, one of nature's most versatile materials. There, ALCOA has developed the variety of types and grades of alumina that have made possible—or made better—products ranging from tooth paste to missile nose cones. There, exist the facilities and the man power able to adapt the outstanding chemical, mechanical, thermal and electrical properties of alumina to your needs. Why not let us tackle *your* problem? Simply describe it in a letter to ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 709-B Alcoa Building, Pittsburgh 19, Pennsylvania.

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In almost every industry, during times when supply can more than meet demand, there comes into being a rash of pseudo businesses whose foundations are built solely on the soft sands of opportunism*. The term "Hip Pocket" has become the common denominator for members of this group.

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*Webster defines opportunism as "a taking advantage of circumstances with little regard for principles or ultimate consequences."

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They Say—

Keep up the good work

Dear Sir:

Your February 1 editorial, "Antitrust Laws—or Antibusiness Weapon?" (p. 57), certainly put the issue strongly. This is what it is going to take to inform citizens and lead them to see the injustice of the present practices of the Department of Justice.

It has been repeatedly demonstrated that a philosophy based on the economics of the market place gives the consumer a better quality, lower price product than a philosophy, as you have so aptly stated, based on the unrealistic predilections of legalistic dictators which freezes the business structure by preventing change or experiment.

I hope you will continue to work for the reclarification of the kind of competitive conditions that have made our citizens the most prosperous in the world and for such adjustments in the administration of the antitrust laws as will give business the opportunity to increase competitive effectiveness.

Charles E. Spahr
President
Standard Oil Co. (Ohio)

Sorry, wrong line

Dear Sir:

It has been erroneously reported in your promotion material that Houston Pipe Line Co. was building a 30-in. gas-transmission line from Houston to Port Arthur.

Our company does have facilities to Port Arthur. The new line that we have constructed, however, is in the Houston area, and we plan no 30-in. line to Port Arthur.

Robert L. Dabney
Vice President
Houston Pipe Line Co.

10,000 jobs

"The drilling industry of Canada could provide direct and indirect employment for 10,000 people if drilling programs were provided to utilize the industry's idle rigs.

"Approval for additional export of natural gas from Canada would stimulate the industry and increase the tempo in development and exploration drilling.

"We believe that prompt action to facilitate the export of gas to those markets which are now available will

SCALE PROBLEMS?

INHIBITED ACID

Bulk Inhibited Hydrochloric Acid has many uses to help solve both maintenance and production problems. For instance, Dowell Inhibited Acid is useful for cleaning scale and gyp from producing formation, tubing and lead lines; cleaning scale from piping, valves, fittings and nipples; dump-job treatments in old dolomite or limestone wells. Particularly suited to do-it-yourself treatments. Available in bulk lots at all Dowell stations. Economical.

Products for the oil industry

DOWELL

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DIAL DOWELL

be of great assistance to our industry. This improvement would reflect in benefits for the entire economy."

S. W. Shambaugh, president, Canadian Association of Oilwell Drilling Contractors, in a letter to the Canadian National Energy Board.

Research payoff expected

"The future appears to hold great opportunities for the oil man. Seldom has he been under such pressure as he is today to achieve new breakthroughs which will improve the profitability of his business.

"Never has he spent more in researching his problems than he is spending now—a total estimated at $300 million annually. If history is a guide, good things will come of this."

Robert G. Dunlop, president, Sun Oil Co., in a speech to the Columbia University oil centennial symposium.

Running to keep up

"If problems are the main catalyst to achievement, we are in a fine position to move ahead in the 60's.

"The first problem businessmen will face will be increasingly severe competition. While there are continual improvements being made in manufacturing methods and continual introductions of new products, the resulting benefits tend to be transitory for the individual company.

"The reason is obvious enough. Since our competitors also have able, dedicated people, the advances we are able to make can be, and almost always are, duplicated by others. In consequence, a business has to run hard to just maintain its position in the field.

If a company really wants to grow and prosper, it must be a leader in bringing about changes—not a follower.

"Unfortunately, there will be some businessmen unable to adapt themselves to change. And only too often they and their marketing staffs will be tempted to substitute price reductions for sales effort and ability.

"The ultimate result of this approach, of course, is liquidation of the unprogressive business, but in the meantime its unrealistic price slashing is rough on everybody else. Thus I think th 60's will see increasingly severe price competition and declining profit margins in many lines."

John E. Swearingen, president, Standard Oil Co. (Ind.), in a speech to officers of the American National Bank & Trust Co. of Chicago.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

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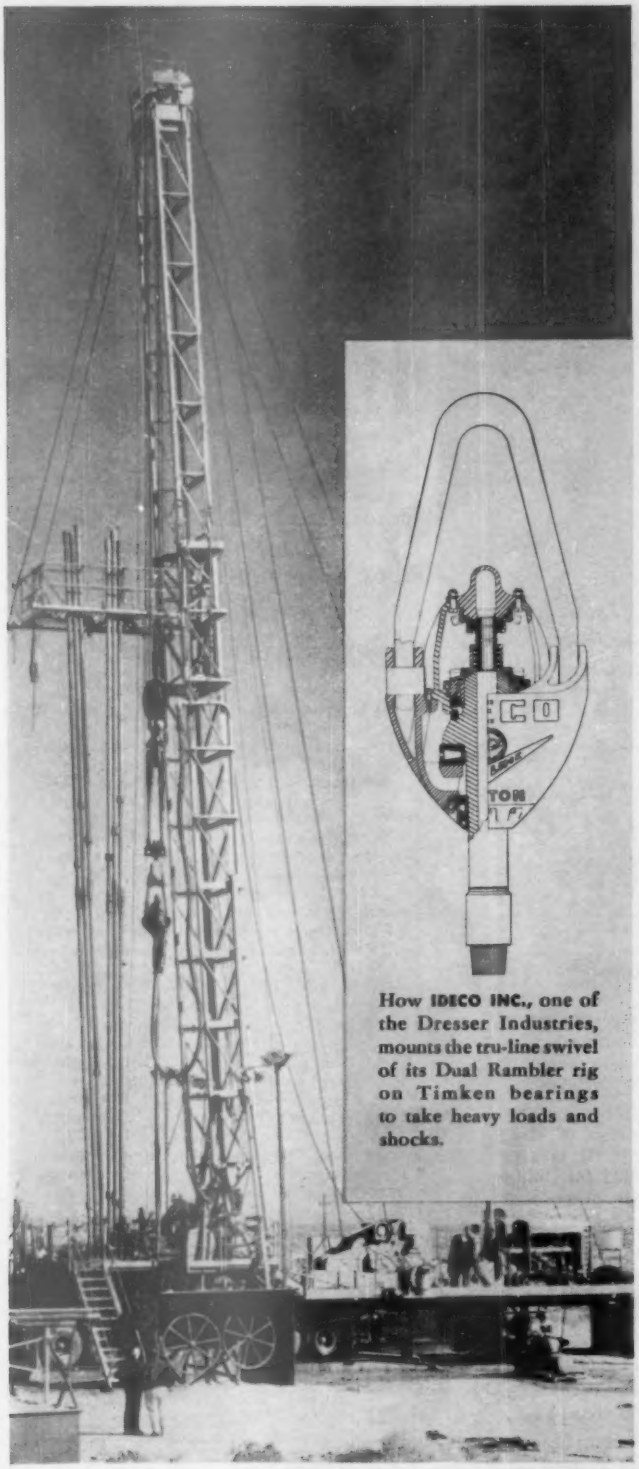

How **IDECO INC.**, one of the Dresser Industries, mounts the tru-line swivel of its Dual Rambler rig on Timken bearings to take heavy loads and shocks.

SETS UP FAST... fast on the job with Timken® bearings to eliminate breakdowns

IDECO'S Rambler Rigs combine the advantages of modern heavy-duty equipment with high mobility to provide faster, more economical operations. And to insure continuous, high speed operation under heavy loads and dirty operating conditions, Ideco specified Timken® tapered roller bearings at four critical load-carrying points—swivel, crown block, traveling block and rotary table.

Tapered construction lets Timken bearings take radial and thrust loads in all combinations. And with full line contact between Timken bearing rollers and races you get *extra* load-carrying capacity. By keeping shafts concentric with housings, Timken bearings make closures more effective in keeping lubricant in, keeping dirt and dust out.

And Timken bearings practically eliminate friction—reduce wear on related parts, prolong life. They're geometrically designed to give *true rolling motion,* precision-made to do just that in actual daily service. We even make our own steel—something no other American bearing maker does.

Insist on Timken bearing quality, as Ideco has done for years. When you build or buy machinery for the petroleum industry, look for the trademark "TIMKEN" on every bearing. It's your symbol of Better-ness. ***When you buy Timken bearings you get...*** *1) Quality you can take for granted. 2) Service you can't get anywhere else. 3) The best-known name in bearings. 4) The pace setter in lower bearing costs.* The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".

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tapered roller bearings

with new **Carbo Zinc 11***

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Becomes water insoluble 20 minutes after application

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Carbo Zinc 11 is not only a new coating, it is a new *concept* in zinc filled inorganic coatings, with desirable properties not found in other protective coatings. In only 20 minutes the coating becomes insoluble in water. It can be applied directly to damp surfaces, in 90-100% humidity and at temperatures as low as 0°F.

Only one coat provides long-lasting galvanic protection to steel surfaces in marine, coastal and offshore environments. It is also insoluble in organic solvents, and is highly recommended for lining of solvent storage and cargo tanks. And look at its other outstanding characteristics:

- Prevents subfilm corrosion
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- Does not blister — cures from inside out
- No curing solution required
- Brush or spray application
- In non-immersion service, can be applied over a commercial blast, brush blast or wirebrushed surface

Write today for complete information, technical data, uses and sample of this remarkable new coating—Carbo Zinc 11.

**Patent applied*

carboline COMPANY

Coatings with Experience

32-S Hanley Industrial Ct., St. Louis 17, Mo.

CALENDAR

FEBRUARY

24-25 Wisconsin Petroleum Association annual convention and exhibit, Schroeder Hotel, Milwaukee.

24-25 Oklahoma State University, technical conference on natural gas engineering, Stillwater, Okla.

25 American Chemical Society, Delaware Valley region petroleum symposium, Philadelphia.

24-26 National Association of Corrosion Engineers, Tulsa section, eleventh annual corrosion short course, Mayo Hotel, Tulsa.

26 Natural Gasoline Association of America, Permian Basin regional meeting. Lincoln Hotel, Odessa, Tex.

26 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

MARCH

2-3 University of Oklahoma, gas conditioning conference, Oklahoma Memorial Union Building, Norman.

2-4 American Petroleum Institute, Division of Production, southwestern district meeting, Statler-Hilton Hotel, Dallas.

3-4 American Gas Association, Pacific Coast Gas Association, joint public relations conference, Biltmore Hotel, Santa Barbara, Calif.

4 Southern Gas Association, transmission management conference, Jung Hotel, New Orleans.

6-9 American Society of Mechanical Engineers, gas turbine power and hydraulic conference, Rice Hotel, Houston.

7 Canadian Petroleum Association, annual general meeting, Hotel Palliser, Calgary.

7-8 University of Florida, annual heat transfer symposium, Engineering and Industries Building, Gainesville, Fla.

10 Petroleum Equipment Suppliers Association, northern Mid-Continent district meeting, Tulsa.

11 American Institute of Chemical Engineers, Sabine area section; American Chemical Society, Texas-Louisiana Gulf section, seventh annual joint technical meeting, Lamar State College of Technology, Beaumont, Tex.

14-18 National Association of Corrosion Engineers, sixteenth annual meeting, Memorial Auditorium, Dallas.

16 Petroleum Equipment Suppliers Association, eastern district membership meeting, Duquesne Club, Pittsburgh.

16-18 American Petroleum Institute, Division of Production, southern district meeting, Hilton Hotel, San Antonio.

18 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

21-23 Midwest Gas Association, annual meeting, Hotel St. Paul, St. Paul.

21 University of Texas, school of gas technology, sixth semi-annual term, Kilgore College, Kilgore. Term ends April 29.

23 Petroleum Equipment Suppliers Association, Pacific district annual membership meeting, Ambassador Hotel, Los Angeles.

24-25 New England Gas Association, annual meeting, Hotel Statler-Hilton, Boston.

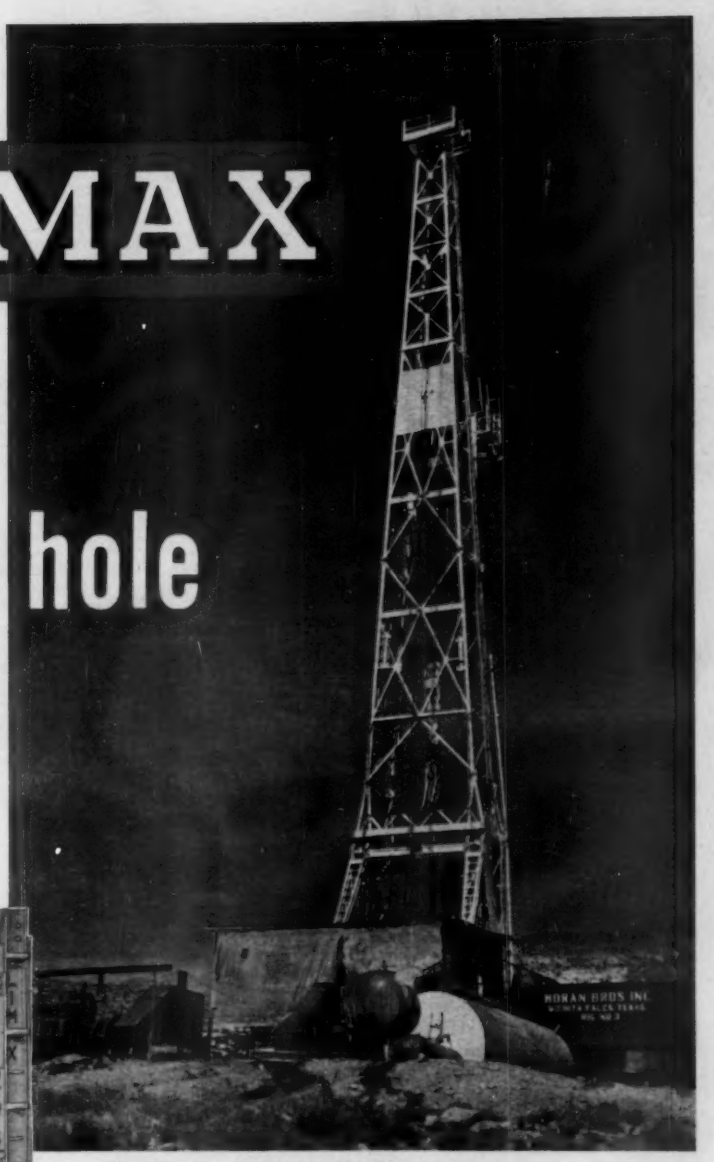
25-26 North Texas Oil and Gas Association, thirtieth annual meeting, Kemp Hotel, Wichita Falls, Tex.

IT'S CLIMAX

for the 44-inch hole

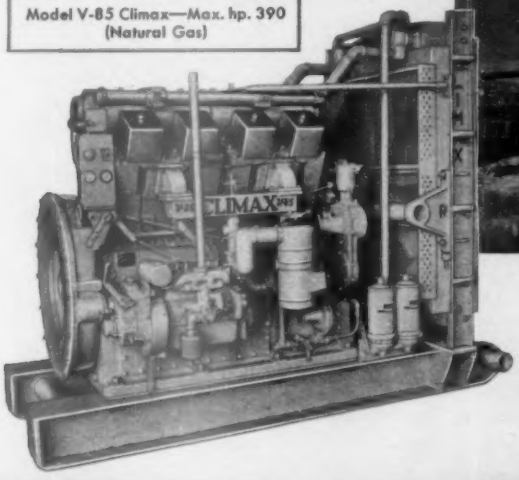
TWO V-85 CLIMAX ENGINES ON TOP
...HANDLE 122 TONS IN THE HOLE

[Reamer bit, four collars, basket, and 965 feet of 13⅜-inch pipe weigh 244,000 pounds in the hole.]



Moran Bros., Inc., Rig No. 3, making 44-inch hole in solid granite, 85 miles north of Las Vegas.

Model V-85 Climax—Max. hp. 390 (Natural Gas)



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MODEL	Bore and Stroke	Displacement	Torque @ RPM	BRAKE HORSEPOWER AT SPEEDS INDICATED					
				600	700	800	900	1000	1100
R-110	6⅛ x 7	824	468 @ 800	52	62	71	79	86	91
R-165	6⅛ x 7	1238	684 @ 750	81	93	105	117	127	135
K-67	7 x 7	1616	955 @ 805	110	129	145	161	176	188
K-75	7½ x 7	1855	1090 @ 800	126	146	166	185	204	218
V-80	7 x 7	2155	1240 @ 850	140	165	188	210	230	246
V-85	7½ x 7	2474	1440 @ 900	164	194	223	246	266	284
V-122	7 x 7	3232	1915 @ 900	217	258	293	328	353	378
V-125	7½ x 7	3711	2220 @ 850	242	292	340	384	417	442

Write for descriptive literature

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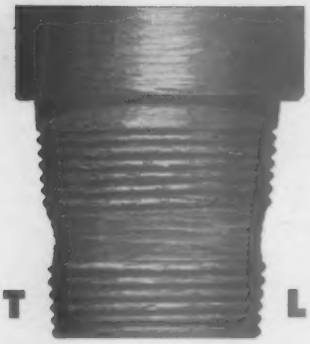

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This joint lost money for its owner because it was not properly doped. Properly made-up and lubricated with a WECO Tool Joint Compound zinc-base No-Gall or lead-base Lo-Tork, it would have been a money-maker.

WECO Compounds are made of 50% pure metallic lead or zinc dispersed in a neutral oil with a tacky additive. They always remain soft in the can under all extremes of hot or cold weather and never require thinning.

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HOUSTON, TEXAS

WECO Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

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28 University of Texas, American Petroleum Institute Division of Transportation, school of pipeline technology, eighth semi-annual term, Lee College, Baytown, Tex. Term ends May 6.

28 University of Texas, American Petroleum Institute Division of Production, institute on automatic production controls, first term, Odessa College, Odessa, Tex. Term ends May 6.

29 Petroleum Equipment Suppliers Association, Gulf Coast district membership meeting, Shamrock Hilton Hotel, Houston.

28-30 Western Petroleum Refiners Association forty-eighth annual meeting, Hilton Hotel, San Antonio, Tex.

29-31 American Power Conference, annual meeting, Sherman Hotel, Chicago.

30-Apr. 1 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Broadview Hotel, Wichita.

APRIL

3-8 Engineers Joint Council, sixth nuclear congress, New York.

4-7 Oil Heat Institute of America, annual convention, Park-Sheraton Hotel, New York.

4-7 National oil heat and air-conditioning exposition, Coliseum, New York.

5 Petroleum Equipment Suppliers Association, southern mid-continent district membership meeting, Statler Hilton Hotel, Dallas.

5-6 University of Kansas, eighth annual gas compressor institute, National Guard Armory, Liberal, Kans.

5-7 Instrument Society of America, national chemical and petroleum instrumentation symposium, Rochester, N. Y.

7-8 Rocky Mountain Oil and Gas Association, midyear meeting, Newhouse Hotel, Salt Lake City.

8 Chemical Institute of Canada, rubber chemistry division, annual meeting, Kitchener, Ont.

12-14 Petroleum Industry Electrical Association, Petroleum Electric Supply Association, conference and exhibition, Municipal Auditorium, Kansas City.

15-16 Society of Economic Paleontologists and Mineralogists, Pacific section, annual spring field trip, Panoche Hills, San Joaquin Valley, California, and evening meeting, The Hacienda, Fresno, Calif.

19-21 University of Oklahoma, College of Engineering, southwestern gas measurement short course, north campus, University of Oklahoma, Norman.

20 Chemical Institute of Canada, joint meeting, Quebec rubber and plastics group and Montreal section, Queen's Hotel, Montreal.

20-22 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

20-22 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

20-22 Oklahoma State University, technical conference on heat transfer, Stillwater, Okla.

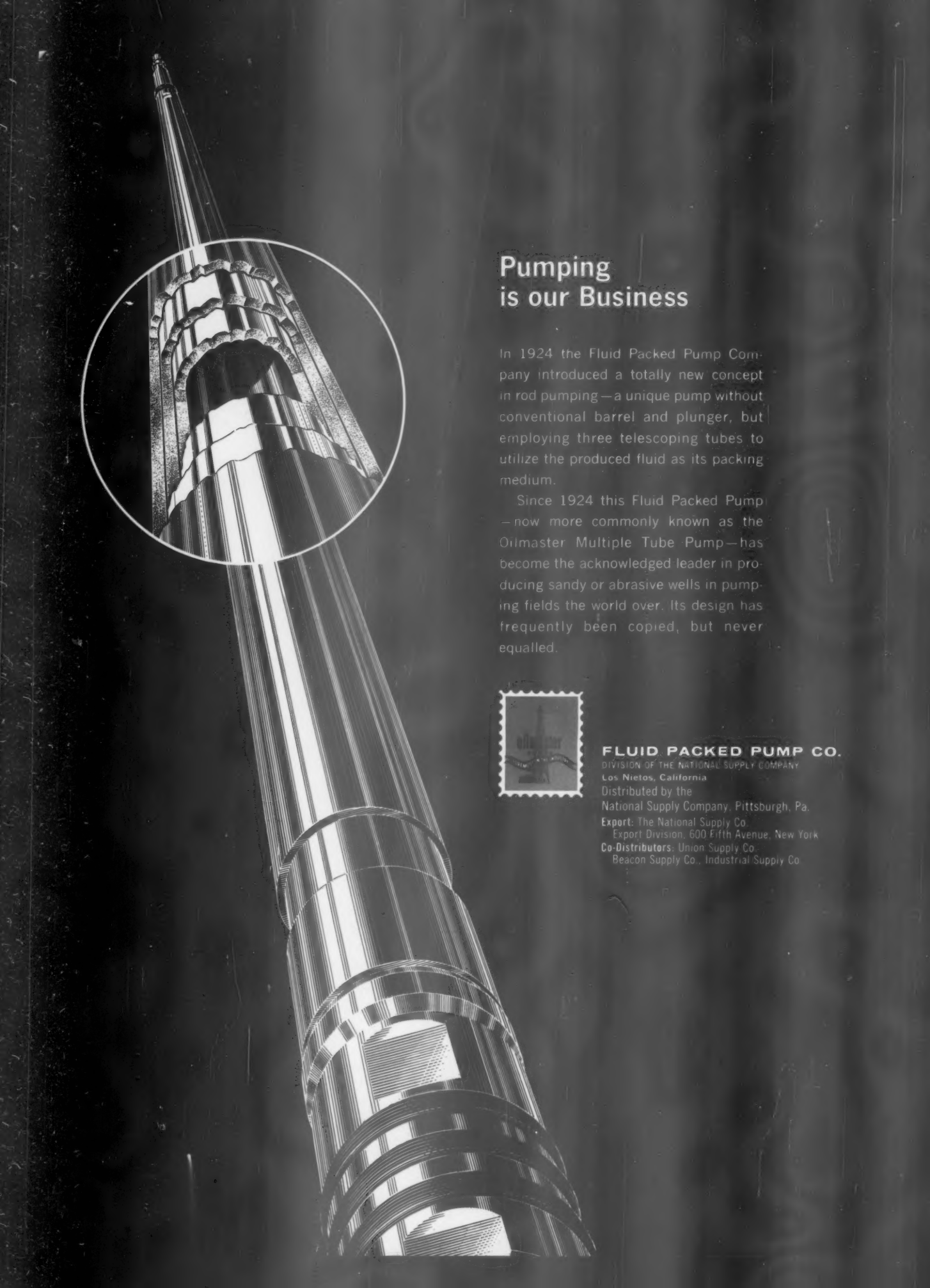
21-22 Texas Technological College, seventh annual West Texas oil lifting short course, Lubbock, Tex.

24-26 Independent Petroleum Association of America, midyear meeting, Denver Hilton Hotel, Denver.

per·form'·ance operation or functioning, usually with regard to effectiveness.

WEBSTER

A new concept in hydraulic pumping—The Balanced Design—gives the Oilmaster Subsurface Hydraulic Production Unit a level of performance that challenges many of the concepts of artificial lift. If performance is measured in terms of pump capacity, the rated output of an Oilmaster hydraulic in 2" tubing exceeds the potential of all but the highest productivity wells. In wells where capacity is not a production criterion, the same unit can operate as slowly as one-tenth its rated capacity with complete stability and with unprecedented efficiency and dependability. Ask your Oilmaster representative to give you the details on the effectiveness of this high performance method of production, or write for Bulletin E5903.



Pumping is our Business

In 1924 the Fluid Packed Pump Company introduced a totally new concept in rod pumping—a unique pump without conventional barrel and plunger, but employing three telescoping tubes to utilize the produced fluid as its packing medium.

Since 1924 this Fluid Packed Pump—now more commonly known as the Oilmaster Multiple Tube Pump—has become the acknowledged leader in producing sandy or abrasive wells in pumping fields the world over. Its design has frequently been copied, but never equalled.

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the Journal said...

50 years ago

March 6, 1910

A well drilling a mile offshore in Lake Erie from Selkirk, west of Welland, Ont., has struck gas in large volume. The gas is being piped to shore to supply the nearby towns of St. Catherines and Hamilton. Extension of the line to Toronto is proposed. The drill is being operated from a scow anchored in the lake.

Bringing in a well flowing more than 2,000 bbl. of 21°-gravity oil from a 700-ft. sand at Hoskins Mound turns the spotlight on this old shallow salt dome field in Brazoria County on the Texas coast. Mound Oil Co., the owner, rates this, its 23 well, next to its still-producing discovery well, which came in in 1905 flowing 3,000 bbl. daily from 582 ft. Since then two other good wells have been completed, the last in 1909 at 668 ft.

25 years ago

February 28, 1935

President Roosevelt signs compromise Connally bill reestablishing federal control of oil production through regulation of commerce. The new bill is designed to prohibit interstate shipments of illegally produced oil and its products.

Leasing and drilling activity in Kansas nears 1930 peak level. Oil production climbs to all-time high of 146,750 bbl. daily.

Major Texas Gulf Coast oil discovery (Anahuac field) indicated east of Anahuac in northern Chambers County. Humble Oil & Refining Co.'s 1 Middleton wildcat comes in with flow of more than 500 bbl. of 33.5°-gravity oil daily through ¼-in. choke from 7,000-ft. Frio sand.

10 years ago

March 2, 1950

New lubricants plant costing $20,000,000 and turning out 90,000 gal. of finished oil-blending stocks daily goes into operation at Pure Oil Co.'s Smith's Bluff refinery at Nederland, southeast of Beaumont, Texas Gulf Coast. Opening ceremonies draw crowd of 3,000 employes and visitors.

A radioactive well-logging method combining gamma ray and neutron readings into a single operation introduced to the oil industry. Substantial savings in logging time and costs over conventional one-reading methods are promised.

Texas Railroad Commission orders 8-day shutdown of booming Scurry County's Canyon reef fields to check reported excessive declines in bottom-hole pressures.

JOURNALLY SPEAKING

Fifth Column

YOU WON'T READ a column like this again for 28 years. Unfortunately, you probably will read some just as poor as this, but they won't be quite like this one.

What makes today's column unique is that it's the fifth one this month—and February 29 falls on a Monday only every seven leap years.

It's hard enough to fill up this dadburned page four times a month, but when the fifth time comes in the shortest month of the year, that's adding insult to injury. So don't expect much.

Actually this is a bonus, an extra-special added attraction. You get five issues of the Big Yellow Book in this sawed-off, squeezed-down, bobtailed little month of February. Where else can you get so much for your money?

We started to do some research on this calendar oddity. We found that back in 1932 there were also five Mondays in February. But in those days the Journal was published on Thursdays. Sometime during our 57 years of publication there may have been a February in which we put out five issues, but we didn't have time to dig into the question, what with having five Mondays crowded into such a short month.

But just hold on. Unless our astrologer is off the beam, if you keep your subscription paid up until 1988 you'll get five issues in February again. How's that for an inducement? What other oil magazine dares make such a claim?

We can't say we weren't forewarned that February would be a fifth-column month. We became aware of this subversive situation the day we hung up our 1960 calendar, and have been worrying about it ever since.

We kept thinking that surely February, being such an odd-ball month anyway, would turn up something for a fifth column, and especially in Leap Year. But nothing worked out.

First there was Ground Hog Day. We gave long and serious consideration to the possibilities for drawing an analogy between that silly varmint and the oil industry, such as, for instance, how it timidly crawls into a hole whenever it sees the shadow of excess capacity, low prices, imports, the Federal Power Commission, or the Department of Justice.

But that might be considered unkind, and we would never, never want to be considered unkind. Cross our heart and hope to die.

Speaking of hearts, there was Valentine's Day. We thought it would be very nice to write a sweet message of affection for the oil industry to send to someone who loves it—you know, something real flowery and loaded with sediment—er, we mean sentiment. But we couldn't think of anybody to be on the receiving end.

Besides, we couldn't elevate our mind to such a noble plane. It stayed down in the gutter and turned out nothing but material for so-called comic valentines—clever and original sonnets like gas producers telling the FPC: "Roses are red, violets are blue, vinegar stinks, and so do you."

There were a couple of holidays in February, and we considered writing something about it being the birth month of two U. S. presidents who became famous without ever taking any swipes at the oil industry or interfering with it in any way. But we passed up that topic because those days are gone forever.

So we finally came down to Leap Year Day, the day, tradition has it, that girls can propose to men who have resisted their wiles heretofore. Desperately we wracked our brain for something appropriate for that once-in-a-quadrennial opportunity.

Let's see now, could we suggest that the independent producers propose marriage to the importers? Or the coal industry to the gas industry? How far-fetched can you get? So there went the last chance to get a topical column out of February.

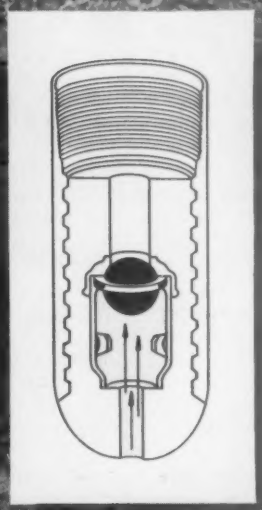
We have a friend (he says he's a friend, but we don't think he's very complimentary) who says he likes our column best when we admit that we can't think of anything to write about. He ought to consider this one a masterpiece.

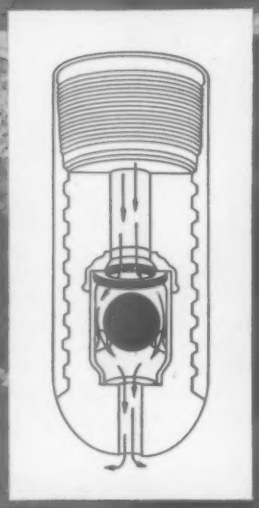
We have absolutely nothing to say about the twenty-ninth of February, and by golly we said it.

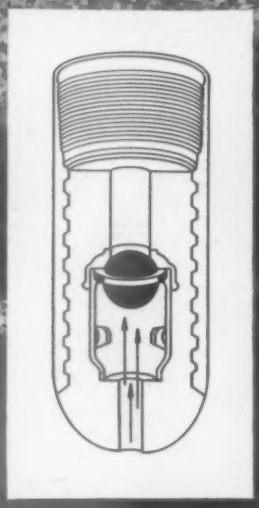
—Henry D. Ralph

NOTHING SEALS LIKE THE *BAKER* "FLOATING" BALL

It "rolls with the punch" of circulating fluid and cement slurry — never stationary long enough to be eroded or cut away in any one place on its continuously smooth sealing surface.







RUNNING IN

The floating ball — in the securely anchored Bakelite cage — maintains a leak-proof back-pressure seal against high- or low-pressure differential while the casing is "floated" down the hole. Note the absence of springs or guides to warp or stick and prevent a positive shut-off.

CEMENTING

Ample passageways are provided for the cement slurry, which cannot erode or damage either the protected sealing ring or the revolving ball as it rests on strong fingers in the Bakelite valve cage. When cementing is completed and pump pressure is stopped . . .

AFTER CEMENTING

. . . the ball floats upward to seat and seal instantly against the recessed sealing ring. There are no aluminum parts or steel springs to drill up — only Baker concrete and Bakelite which break up into small fragments and circulate out of the hole.

For better all around **PRIMARY CEMENTING** use Baker Casing Centralizers and Baker Wall Scratchers with *your* choice of Baker Cementing Shoes and Collars.

BAKER SHOES AND COLLARS

with the dependable Floating Ball

BAKER OIL TOOLS, INC. HOUSTON · LOS ANGELES · NEW YORK

What's the matter with the oil business?

THE INDEPENDENT Petroleum Association of America has created a special study committee to find out what's the matter with the oil business.

Good for IPAA! This is a novel and revolutionary approach.

Up to now there has never been any doubt about why the oil business isn't prospering as much as it should. Any oil man would give the explanation at the drop of a hat. The only trouble was that these explanations seldom agreed with the facts or with each other.

THE CHIEF VILLAIN used to be imports. When pinned down, an independent producer would admit that imports might not be the sole cause of his troubles. But he gave little thought to any others.

Now that imports have been cut down to size without improving the industry's health, the Jeremiahs are frustrated in naming a scapegoat. We hear oil's woes blamed on such things as:

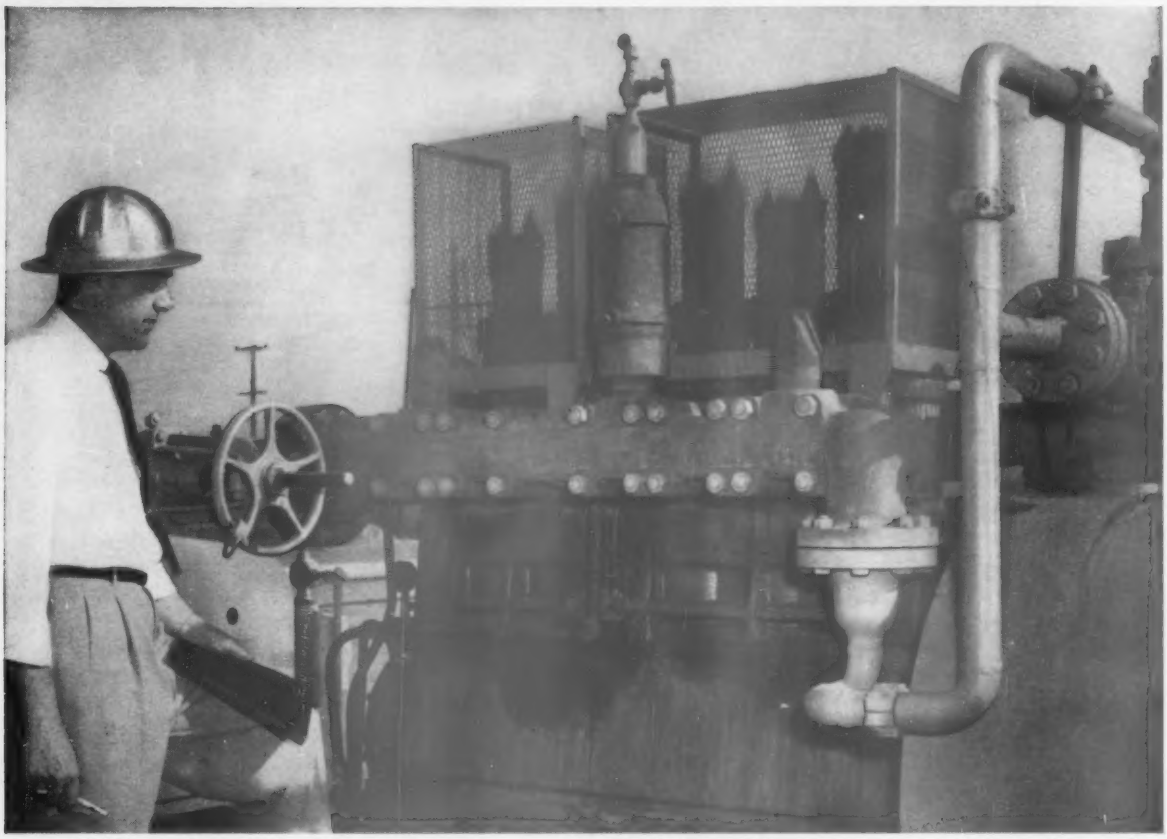
- The quota system that makes all refiners importers.
- Failure of consumers to use as much as anticipated.
- Cheap natural gas.
- Unusual weather.
- Too many filling stations.
- Excessive allowables in prorating states.
- Lack of proration in many states.
- Unrealistic nominations by crude buyers.
- Obsolete spacing and regulatory laws.
- Refiners' infatuation with the incremental barrel.
- Discriminatory practices by common purchasers.
- Mismanagement by the majors.
- Mismanagement by the independents.

WE SUSPECT that the IPAA's inquiry will show that some of these things are effects rather than causes and that the real causes are much deeper than any of those commonly mentioned.

We suspect the basic cause will be found to be that the industry has excessively expanded its capacity to produce, refine, and distribute just at a time when the increase in the demand for oil has slowed down.

We suspect that the symptoms and side effects which cause so much complaint stem directly from the stubborn refusal of all segments of the industry to face up to the changed conditions and adapt their operations accordingly, and that virtually everybody in the industry is trying to do business in the same old way and is looking to somebody else to do something that will permit him to continue without change.

And that, we suspect, is really what's the matter with the oil business.



Nickel-aluminum bronze protects the fluid ends of pumps made by Aldrich Pump Company of Allentown, Pa. from costly salt water corrosion. Philadelphia Bronze and Brass Corporation is supplying Aldrich with nickel-aluminum bronze (5% nickel) working barrels, suction and discharge manifolds, valve spring retainers, stuffing boxes, gland rings, studs and nuts for stuffing boxes, and plunger rod bushings.

Pumps salt water... is 6 times more corrosion-resisting with nickel-aluminum bronze fluid ends

No working barrel failures and no evidence of corrosion after two to three years service

Salt water corrosion of pump parts was a serious and costly maintenance problem at a California waterflood. In some cases corrosion fatigue knocked out carbon steel working barrels within a short two to four months. And other fluid end parts had to be replaced much too soon. Then...

the Aldrich Pump Company introduced fluid ends of Ni Bral*, nickel-aluminum bronze

Highly resistant to corrosive salt water, working barrels of nickel-aluminum bronze have neither failed nor shown evidence of corrosion after two to three years service at discharge pressures up to 5200 psig.

And nickel-aluminum bronze is not only boosting the service life of the other fluid end parts, it is also providing these parts with better pressure tightness, improved wear, and greater strength.

Proves ideal for oil field service

Experience from this and many other cases shows that nickel-aluminum bronze gives efficient protection against both treated and untreated oil field brines and sea water... that it provides the properties needed for reliable performance of pump components, valve discs, and housings in corrosive oil field service.

Whether your metal problem is with pumps, or some other type of equipment, send us the details. Our Development and Research Division will be glad to work with you and help find a solution. *Registered trademark

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL ALLOYS PERFORM BETTER LONGER

A 3-Year Look at Capital Expenditures

(Millions of dollars)

	1958	1959	1960 (Planned)	Change, '60 vs. '59
Drilling and production*	3,660	3,900	4,100	Up 5.1%
Manufacturing	730	540	675	Up 25.0%
Marketing	385	437	508	Up 16.4%
Pipelines	1,080	1,030	1,140	Up 10.7%
Gas and storage	830	950	1,000	Up 5.3%
Crude and products	250	80	140	Up 7.5%
Other†	300	350	335	Down 4.3%
TOTAL	6,155	6,257	6,758	Up 8.0%

*Includes natural-gasoline and cycling plants. †Includes other general expenditures plus transportation other than pipeline.

Oil Is Spending More This Year

• Most company budgets have come through the initial shakedown period now, and an extensive Journal survey shows the industry is aiming at an 8% increase in capital expenditures over 1959.

A VOTE of confidence is being given the domestic oil and gas industry by operators who have put the finishing touches on their spending budgets for the year.

Renewed activity is reflected in every branch of the industry in the 8% increase in capital expenditures planned for 1960.

Before the year is out operators expect to spend $6.7 billion compared to $6.2 billion last year.

Spending for drilling and production far outstrips the outlays planned for any other branch. Budgets call for $4.1 billion expenditures in the field. Pipelining, with $1.1 billion, is the next largest category. Manufacturing has an overall budget of $675 million and marketing $508 million.

The survey . . . Only now is this expenditure picture clear. It comes at a time to give some cheer to many segments of the industry now being tormented by seasonal doldrums.

Not until February actually does the true picture of industry spending for the year appear. By now most companies have obtained approval by directors for proposed budgets.

The Oil and Gas Journal surveyed all divisions of the industry to obtain data on expenditures. The returns were remarkable. They represented companies and individuals producing 55% of the crude, charging 82% of all crude to stills, and marketing 82% of all petroleum products.

From this predominate sampling the true trends in capital expenditures become evident at this time.

Refining

The spending data on manufacturing would seem to belie the present quiet existing in new refinery construction.

Growth in refining and chemical capacity is by spurts. Additions reached a peak about 1957. The resulting excess in capacity tended to hold back construction during 1958-59. Current plans call for an increase in expenditures over 1959, but the total still will be less than 1958 and far below the 1957 peak.

Refiners actually still are operating at about 86% of capacity. This means the domestic industry is carrying about 1,350,000 bbl. daily of excess crude capacity. That is still more of a margin than the industry wants.

The result is that new construction adding crude capacity literally is at a standstill. Reliable estimates indicate that expanding demand will not bring crude runs up to the workable 90% capacity level until late in '61.

Crude capacity is being boosted in

other ways than by construction. Companies are still adding to throughput capacity by bottleneck removal, better programing of crude processing, and incremental additions to equipment which provide small gains in their refinery ratings.

The Journal survey of refining capacity, scheduled for publication March 28, is now about 90% complete. It indicates an increase of about 1.8% over 1959. However, new building projects directed at expanding crude throughput are so few as to be negligible.

Explanation . . . Why, then do manufacturing budgets of spending reach $675 million?

Some of this money is going into downstream units which add no capacity but boost product quality. Alkylation, catalytic hydrogen treating, and other process units are going in here and there. Even these represent only a fraction of the building boom in the mid-50's prompted by the Government's fast write-off program.

An important factor today in manufacturing budgets is petrochemicals. Of the $675 million earmarked this year for spending in manufacturing, fully $240 million will go into chemicals. This represents a gain of about 20% over last year's outlay in this area. This aggregate budget concerns primarily units in refineries or adjacent plants designed to produce basic or intermediate petrochemicals. It does not cover the sums going into capacity for finished plastics, fibers, rubber products, etc.

A break in the current construction lull in refinery building is anticipated later this year. Bids are now out or going out for sizable projects which will become necessary as demand catches up with supply in 1961 or 1962. In this respect, capital expenditures point the way to a resumption of new construction in refining. But it will be moderate. Not until next year is any substantial increase in refinery investment anticipated in this country.

Drilling-Production

Drilling and production expenditures programed for 1960 show a larger percentage gain over 1959 than is indicated by the number of wells forecast.

One reason for this larger increase is the big percentage of total 1960 drilling which will be wildcats, and wildcat drilling tends to be more expensive than development work. Also, the depth of an average wildcat is greater than for the average development well.

Since the average wildcat is deeper and all of the gain for 1960 can be credited to wildcats, total footage for the year is expected to increase despite a slight decrease expected in the number of holes drilled.

Part of the increased footage for 1960 also is expected to come from shifts in drilling by areas. One of the largest increases projected for a state this year is the gain of 174 wells in Louisiana. The increase in footage in South Louisiana (onshore) is more than the total gain expected for the whole country. On the other hand, shallow drilling in Kentucky is expected to be down in 1960.

It's this shift from shallow to deep areas that calls for more drilling money in 1960 than was spent last year.

Part of the drilling-production expenditures also covers new field-processing facilities. These are expected to total $90 million, representing a 15% gain over last year.

Marketing

There has been a steady increase in capital expenditures for marketing since about 1952.

The total scheduled for 1960 will be almost double the spending for that early year.

Heavy marketing expenditures result from a growing realization that the volume of crude needed or changes in refining will depend on changes in volume and quality of petroleum products sold.

The refiner who depends on contract and spot sales to move the output from his plant has no trouble showing a reasonable profit on his investment as long as there is no extended period of oversupply.

In the period just after World War II, the average refiner could sell every gallon he could produce at his plant. Additions to capacity have risen faster than growth in demand for petroleum products.

The end result of these changes has been increasing pressure on spot product prices every time there is even a small surplus of products in primary storage. More and more refiners are expanding market facilities to take care of production from existing and planned units.

Companies also are becoming more integrated from crude production through retail sales. The explanation is simple: In periods of product oversupply, spot-market prices drop faster than retail prices. The supplier who sells more of his products near the retail level has less fluctuation in his income from a barrel of crude.

Changes in marketing patterns also stem from changes in highways, shifts in population, and growth in demand for special products. And all of these call for increased capital expenditures.

Pipelining

The $1.1 billion programed for capital spending in pipelining during 1960 follows a similar pattern in which natural-gas building dominates the picture.

Natural-gas pipelining in recent years has accounted for 80% or more of the capital expenditures made in the pipeline industry. The 1959-60 period is no exception, reflecting still the growth character of natural gas as compared with crude oil.

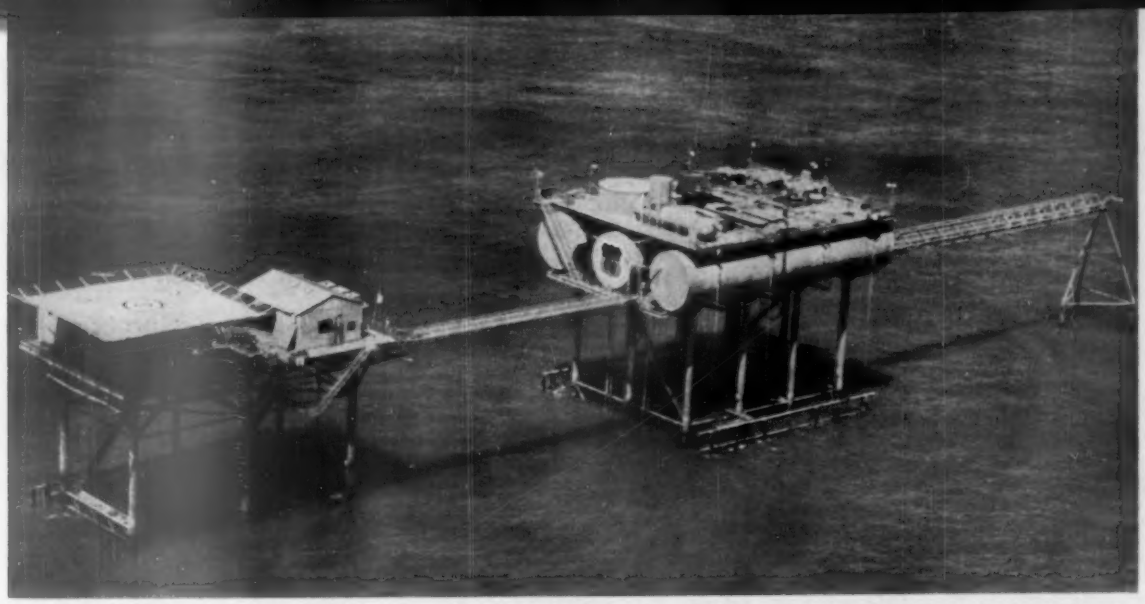
The industry consistently in the last 10 years has spent annually some $600 million to $1 billion on transmission and storage of natural gas. Expenditures are expected to continue at the $1-billion annual rate for some years if supply keeps up with potential market growth.

Crude and products pipeline growth has slackened after the tremendous postwar expansion which resulted from modernization programs, the advent of large diameter systems, and the upsurge in the demand for domestic crude oil. Now with an adequate transportation system established, expenditures for oil pipelines have largely been for modernization, connecting new producing areas, and for new products pipelines.

Expenditures for crude and products line construction last year hit bottom for the postwar period. The increase forecast for 1960 will be due entirely to one project: The $70-million LPG-natural gasoline pipeline to be built from West Texas and New Mexico to Minnesota and Wisconsin.

The outlay for refined products and LPG pipelines is becoming greater than for crude-oil lines. The projected 1960 spending, for example, is $30 million for crude lines and $110 for products. The products-line growth reflects these trends: The growth in total petroleum demand, the increased percentage of total products traffic that moves by pipeline, and the increase in pipelines carrying LPG and natural gasoline.

Crude-line construction is geared more closely to the increase in domestic crude-oil demand and the geography of new discoveries. The biggest outlays recently have been for lines to remote new oil fields, such as the Four Corners area.



OFFSHORE DEAL between Phillips Petroleum and Ocean Drilling & Exploration involved these producing platforms plus adjoining developed and undeveloped acreage in Block 129A off Louisiana.

Phillips Is Sharing Offshore Costs

• Joint venture with ODECO on offshore Louisiana acreage is another deal by Phillips to cut down on high drilling and development costs.

PHILLIPS Petroleum Co. has taken in Ocean Drilling & Exploration Co., New Orleans, as partner in another batch of its Louisiana offshore properties.

The Phillips-ODECO deal involves properties covering 3,800 acres in Block 129A, Eugene Island Area, and containing two producing platforms and 10 wells.

Six of the wells produce about 600 bbl. of crude daily and 1,500 M.c.f. of gas. The other four are shut in.

Why the deal . . . The deal is one of several Phillips is making in order to share the heavy costs of drilling and developing its offshore holdings.

Last June Phillips turned over 21,081 acres in five blocks to Tennessee Gas & Oil Co., a division of Tennessee Gas Transmission Co. At the time there was production in two of the blocks.

Previously Phillips also had dealt with Coral Drilling Co., Fort Worth, and H. S. Coe, Jr., and others of Houston. Phillips reportedly has a deal currently in the fire with another group.

Phillips, with the exception of a few joint interest deals with Kerr-McGee Oil Industries, Inc., at first went it alone in its offshore operations. The trend at that time even was toward operating in syndicates or in joint ventures to share the risks and costs.

Phillips is achieving much the same result through its current deals. In nearly every case, the new company agrees to do so much drilling at a stated capital outlay for a fixed interest of the property. Phillips always retains a nonworking interest.

Work planned . . . ODECO will have an extensive program in full swing on the Eugene Island block by midsummer.

A. J. Laborde, ODECO president, said at New Orleans last week his company plans to do some workovers on the newly acquired wells and undertake an extensive drilling program in the block in July.

ODECO will drill at least four wells this year—both development wells and stepouts. It will use one of its own mobile barges for the work, probably the Eldorado or the Margaret.

Interesting deals . . . The deal Phillips is making with others offshore has many of the earmarks of farmouts, yet they are different.

Neither Phillips nor ODECO announced details of their transaction, but some aspects of the Coral deals are known and are reported typical.

Coral made two deals with Phillips and later brought in The California Co. as partner, with Coral as operator. The basic arrangement is that Coral-Calco is obligated to spend a given amount on drilling and development to earn one-half interest in the leases. At that point, Phillips and Coral-Calco share costs 50-50.

Coral calls this a farmout, although it has variations. For example, one of the leases had producing properties, and these went with the deal.

In the first contract, Coral agreed to spend $4 million on a Bay Marchand lease to earn a one-half interest. Coral used its Mr. Arthur submersible barge to drill four wells—two dry holes, one producer, and one that is being completed as a producer. Coral will continue drilling until it spends $4 million.

Under the contract, Coral could have pulled out after drilling three wells, the basic commitment. The Bay Marchand lease, at the time of the contract signed early last year, contained a couple of shut-in gas wells and two oil wells producing about 125 to 150 bbl. daily.

Under the second contract, involving a Phillips lease in the Vermilion area, Coral agreed to spend $2 million to earn a one-half interest. The contract called for only one well. Coral drilled one dry hole, spent about $1 million, and turned the property back to Phillips. Calco was a Coral partner in this too.

The contracts were attractive to Coral because it got a chance to earn a producing interest. They also, in effect, gave Phillips some development money.

If Money Talks, Operators Are High on

• Bonuses for leases off Louisiana and Texas total more than twice as much as any past offshore lease sale. Even Texas tracts draw some high bids.

THE OIL industry has proved again its unflagging faith in the Louisiana and Texas Gulf Coast by planking down $284.5 million for new acreage—more than double the amount it ever paid before at a single sale.

The outpouring of cash was so encouraging that federal officials this week were considering doing it again later this year. The bids stunned many of the 200 persons who jammed the Claiborne room of the Sheraton-Charles hotel in New Orleans. But no one was complaining. The outcome showed a healthy condition for the industry as a whole and confidence in the gulf's great oil potential in particular.

The statistics . . . The high bonus bids offered on 173 tracts in the 288-tract sale totaled $285,180,648.

However, bids on 10 tracts in Zone 3, totaling $684,416, were rejected by a federal-state committee, and this left the total at $284,496,232.

The federal Government late last week was deciding whether to accept all the bids in Zone 4, which is beyond the disputed zone.

The bonus total in last week's sale topped the previous record of $140 million in 1954 before the bidding was half over. However, the average bid per acre was slightly less than the average of about $395 in past sales. The average last week on some 750,000 acres leased was $379.48. The average in Zone 4 was $509.90, in Zone 3, $429.03, and off Texas $148.59. The total high bids for 240,480 acres off Texas was $35,732,031 and for 511,024 acres off Louisiana $249,448,616.

The top bids . . . While there was nothing in the sale to approach Shell Oil Co.'s mighty $26.1-million bid for a South Pass tract last year ($10,442 per acre), there were plenty of multi-million-dollar offers last week.

Four high bids topped $10 million, and 23 were over $5 million. Eleven bids were over $1,500 per acre. Gulf Oil Corp. and Socony Mobil made the highest single offer—$11.1 million Block 48 (5,000 acres) in South Marsh Island area. This was $2,222 per acre.

The highest per-acre bid, however, was $2,501.51, made by Union of California and Pure Oil. They bid jointly $7,587,000 for Block 49 (3,033 acres), which is adjacent to the Gulf-Socony block.

The sale's most successful bidder was the CATC group (Continental, Atlantic, Tidewater, Cities Service) which captured 15 tracts for $55.2 million. One tract cost $10.3 million and all but three of them cost more than $1.5 million.

The $10.3-million tract (Block 127, Vermilion Area) was a good example of the wide variance in bids at the sale. The next highest bidder, Gulf-Socony offered only $751,000. Many other leases went the same way—the winner apparently having good information on a tract and making sure he got it.

Next to CATC, Shell Oil, offshore Louisiana's biggest operator, was the highest with $33.7 million. Shell scattered its shots more than CATC and picked up 41 tracts, of which 23 were off Texas.

Not all the Texas tracts, however, went for peanuts. Surprising many at the sale, Shell paid better than $1 million for six Texas tracts, and one bid for 5.9 million (Galveston area, Block 288, containing 5,760 acres).

Phillips Petroleum Co. gave a whip-cracking reply to reports that it is "pulling out of the Gulf" by running third in the bidding with 34 million for 12 tracts.

Gulf and Socony were the biggest of the combination bidders. Together they got tracts worth $27.4 million, and, joining with Humble Oil & Refining on other bidding, added another $19.9 million to their total. Significantly, these giants spent their $47.3 million on just six tracts, the cheapest of which cost $3.1 million. Similarly,

The Top 10 Tracts in the Sale

(All tracts 5,000 acres unless otherwise indicated)

Company	Tract	Total Bid	Per Acre Bid
Gulf-Socony	Tract 649, Block 48, South Marsh Island	$11,112,000	$2,222
Gulf-Humble-Socony	Tract 773, Block 169, Ship Shoal	10,636,000	2,127
CATC	Tract 628, Block 127, Vermillion	10,320,000	2,064
Shell	Tract 685, Block 100, Eugene Island	10,002,000	2,000
Gulf-Socony	Tract 632, Block 131, Vermillion (4,923 acres)	8,588,000	1,744
Texaco-Pan American	Tract 775, Block 183, Ship Shoal	8,108,000	1,621
Gulf-Socony	Lease 639, Block 23, South Marsh Island	7,677,000	1,535
CATC	Lease 611, Block 48, East Cameron Area	7,630,000	1,526
CATC	Lease 743, Block 267, Eugene Island	7,630,000	1,526
Union of California-Pure	Lease 650, Block 49, South Marsh Island (3,033 acres)	7,587,000	2,501

The Top 10 Bidders

Companies	Total Bids	Tracts
CATC	$55,200,000	15
Shell	36,716,000	41
Phillips	33,995,000	12
Gulf-Socony	27,377,000	3
Union of California-Pure	20,797,000	3
Gulf-Socony-Humble	19,918,000	3
Union Producing	17,235,000	5
Tennessee Gas	15,547,000	7
Texaco-Pan American	11,913,000	14
Kerr McGee-Felmont-Cabot Carbon	9,768,000	6

Gulf's Future

Union of California and Pure Oil, who bid jointly on a number of tracts, got only three—but these added up to $20.8 million.

Deep water . . . Shell took the big plunge into the deepest waters ever leased by the Government.

It got four tracts for comparatively small pickings in waters ranging from about 240 ft. to 360 ft. deep. Shell and everyone else passed up one tract that had water of better than 400 ft. deep and another tract of 300-360-ft. depth.

The six tracts involved in the deep water are in the Mississippi River offshore trough in the South Addition to the Grand Isle Area. Shell, the only bidder, offered bids of $18.74 to $40.04 per acre for Blocks 109, 110, 116, and 117. Passed up were Blocks 111 and 115.

With Shell in the deep-deep waters, the industry will be looking to the company for something new in drilling. No one, not even Shell, was willing to bid on 12 Louisiana tracts that would have taken their rigs a record distance from shore—80 to 85 miles. Twelve tracts in the South Addition to the South Marsh Island area went begging.

Next sale . . . So pleased with the sale were Bureau of Land Management officials that one of them said another sale can be expected later this year, if the industry indicates it wants one.

"We got more money than anyone had reason to believe," the official said.

The BLM was particularly pleased with the good showing the Texas tracts made in the sale.

There was one note of discord in the proceedings at New Orleans—and it was a note sounded in private discussions of the oil men who gathered for the sale.

What, they asked, is going to happen when the U. S. Supreme Court rules on ownership of the tidelands this year, if Zone 3—the area between the 3-mile and the 10.5-mile lines offshore—goes to the federal Government? Will the allowables for federally controlled acreage go up or down? For that matter, if it goes to the state, what will be the fate of production in Zone 4, which is definitely in federal territory?

The many-sided questions had many answers. But whatever happens, apparently the industry is willing to gamble hundreds of millions that their investment will pay out.

watching WASHINGTON

Clyde La Motte

• Is it wise to get mixed up in politics? . . .

A WORRISOME PROBLEM for many oil executives these days is what role, if any, they should play in politics. The fact that 1960 is a major election year further intensifies this problem.

Time was when the accepted procedure was simply to make a political contribution—often to both major parties—and to issue an election-year statement urging employes to go to the polls and vote.

But quite a few oil men (as well as leaders in other industries) are wondering if that is enough.

They take a look at ever-increasing taxes, at inflation, at increasing government regulation of business and industry practices, and they wonder if they aren't making a mistake by sitting on the sidelines while candidates are being chosen and issues outlined.

Although there has been a trend in recent years for business to lift its voice when certain laws are being made, business is usually silent when the men who make those laws are being elected.

For instance, oil companies go to Washington when percentage depletion is threatened. This is proper. But are the companies equally active in the political campaigns in which congressmen are selected?

This does not mean that the companies would be wise to support a given candidate simply because of his view on one issue. But there might well be more attention given to a candidate's over-all qualifications.

• Arthur Summerfield: "Yes, by all means" . . .

POSTMASTER GENERAL Arthur Summerfield, a former businessman who has been up to his neck in politics in recent years, has some positive ideas on political participation by business leaders.

"It is not only proper for business leadership to assert itself," he said recently, "it is essential."

Being an old pro at the game of politics, Summerfield is aware that one key factor preventing many business leaders from getting into politics is the fear of criticism. This can be a fear of doing harm to one's own company, or it may be the fear of jeopardizing one's own future by drawing the criticism of company superiors.

Summerfield concedes that either may happen, but he would have you weigh on the other side the harm that can come from being silent.

• Some pointers on choosing your role . . .

THERE ARE TWO basic paths to political participation: One is as an individual. The other is as a member of a business organization.

Summerfield advocates getting into the political fray on one basis, or on both. He urges these steps:

. . . **Get interested** in political decision-making at the local, state, and national levels. Otherwise, those decisions will be made by others.

. . . **Study issues carefully,** not only those directly affecting a specific business field, but all that bear on the soundness of our economy and security.

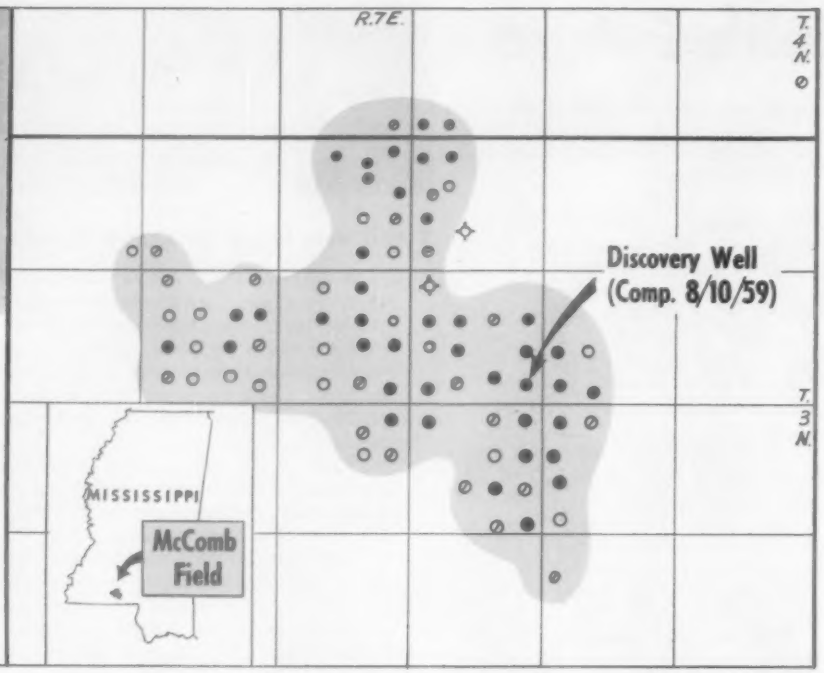
. . . **Participate** in political party activity, either as a candidate or an active supporter; speak out for good candidates, encourage others to participate, and communicate with political and community leaders to let them know what business leadership is thinking, and why.

Also, through one's business organization, the business leader can communicate with those who have an interest in the business—employes, shareholders, customers, suppliers, and community neighbors.

Summerfield winds up by putting the problem squarely in your lap in this fashion: "To every man there must finally come the question: What am I, in all honesty and truth, willing and able to do?"

McComb Field . . . only 6 months old, but growing fast.

Completions	32
Wells Testing	7
Total	39
Drilling Wells	25
Locations	18
Total	43



Mississippi Field Still a Beehive

● Activity continues at a rapid pace in McComb field. It's been a drilling hot spot since the play started last August. It rivals the fast development a year ago of the state's Little Creek field.

Neil Williams
Associate Editor

PREDICTIONS that Mississippi's new McComb field would prove a large and important oil-producing area are being borne out in the current widespread and intensive development there (OGJ, Dec. 28, p. 76).

The field is located just west of the townsite of McComb in western Pike County, in the southwestern part of the state. Although only 6 months old, the field already has:

. . . **Thirty-two completed** oil wells, all flowing.

. . . **Seven additional** assured oil wells testing and in various stages of completion.

. . . **An undefined** known productive area stretching more than 3 miles from north to south, and about the same distance east to west.

. . . **Twenty-five rotary** rigs running with others expected to be moved in.

. . . **More than 45 active** operations, including testing wells on which drilling rigs have been moved off, and already staked and prepared locations waiting rigs.

. . . **At least 50 more** unstaked but prospective locations for drilling within the present proved confines of the field, not allowing for possible extensions.

The field now is the busiest in the state, and has one of the largest concentrations of active rotary rigs in the country for any area of comparable size.

The fast development is being stimulated by a combination of incentives.

First, there is a wide diversification of ownerships, both in land owners and in lease holders.

Second, long stepout tests drilled soon after completion of the discovery well indicated a productive area of fairly wide extent early in the field's life, proving numerous intervening locations.

Then, new leases and farmouts followed in a hurry, many calling for drilling obligations. Added to this, there were some leases nearing expiration dates.

Particularly attractive until now has been the field's emergency daily allowable production of 300 bbl. of oil per well. This is being cut, effective March 1, to 150 bbl. per well. However, the reduction is not being opposed now because, with the mounting list of producing wells, the higher allowable has begun to have a telling effect on flowing pressures.

So far, 16 separate operators or combines of operators have been brought into the play. The largest has been Sun Oil Co., operating alone or jointly with J. Willis Hughes. Currently, 14 drilling contractors have rigs in the field.

Comparison . . . Activity at McComb rivals that which took place in development of its older-sister field at Little Creek, barely 8 miles northeast on the Pike-Lincoln county line. There, during the height of activity the latter part of 1958 and much of 1959, 25 to 30 rigs were kept busy.

Development at McComb, coming close on the heels of decline of drilling at Little Creek, has followed much the same pattern set by that field. Discovery of Little Creek field early in 1958 was followed quickly by a succession of long extensions that gave early proof of a large producing area.

With diversified intervening ownerships, active drilling was precipitated. The same has been true at McComb.

Both fields produce from the same horizon, the Lower Tuscaloosa formation of Upper Cretaceous age, at comparable depths. At Little Creek, the pay zone is at 10,750 to 10,800 ft. At McComb, it runs 150 to 200 ft. deeper with comparable surface elevations.

On the basis of development so far, it does not appear that McComb has quite as good a reservoir as that at Little Creek, although the productive area eventually may be as large.

Sands in most McComb wells have been thinner and tighter, and on the whole, porosity has been poorer. Also, individual well flows, although good, generally have not been as good as those at the Little Creek field. Flowing pressures have been about the same, but gas-oil ratios have been slightly higher, 700 to 1,300 cu. ft. of gas per barrel of oil.

Early estimates do not place ultimate oil recovery from the McComb reservoir above 200 bbl. per acre-foot. That at Little Creek has been figured up to 300 bbl. per acre-foot.

Who has done what in McComb field

Operator	Comp. wells	Testing wells	Drilling wells
J. Willis Hughes and/or Sun Oil Co.	13	4	7
Dorris Ballew and associates	2	..	..
L. D. Elam and associates	2	..	1
George M. Harrison and associates	2	..	2
Barnwell Drilling Co.	..	1	1
Calto Oil Co.	3	..	1
Shell Oil Co.	1	..	2
W. L. Pickens	2	2	1
Nelson Gibson and associates	1	..	..
James Biglane Trust et al.	1	..	1
Lyle Cashion Co.	2*	..	1
C. F. & H. Oil Co.	1	..	1
L. O. McMillan	3	..	4
Sheral Oil Co.	1†	..	..
W. B. Rudman and James Biglane	..	..	1
J. E. Thornhill	..	..	1
Fairchild & Sellers	..	..	1‡
Total	34§	7	25

*Includes one dry hole. †Dry hole. ‡Two-mile southwest extension. §Includes two dry holes.

The discovery . . . McComb's discovery well, drilled by J. Willis Hughes with Sun Oil Co. as joint operator, was completed last August 10. It flowed initially 230 bbl. of 37°-gravity oil per day through 9/64-in. choke from pay-perforations at 10,882-86 ft. Oil gravities in other wells generally have run from 40° to 42°.

Before the same operators had completed a southeast offset as the field's second producer, Dorris Ballew and associates started a stepout test 2 miles northwest. It became the field's third producer, better than the first two, with pay at 10,979½-11,001½ ft.

Then followed a successful stepout well by L. D. Elam and associates 2 miles west of the discovery well, and in quick succession, a mile southwest extension by George Harrison and associates.

Then the race was on, although it was handicapped for a time by lack of available rigs.

Two dry holes have been drilled within recent weeks, but in both cases the failures were due not to locations being off structure, but rather to poor sand conditions locally at these locations. Such instances are not unusual in Tuscaloosa sand development. There were a number of similar well failures within the productive area of the prolific Little Creek field.

The first McComb failure, drilled by Lyle Cashion Co., logged the producing zone at satisfactory depth but found it shaly. Microlog indicated only 4 ft. of net sand in three thin streaks. It is only a location south of a good well with 20 ft. of net sand, two locations east of a well with 18 ft. of sand, and two locations south of another well with 18 ft. of sand.

The second dry hole, drilled by Sheral Oil Co. northeast of the Cashion failure, logged tight, thin sand on structure. The sand showed oil. But in previous experience with thin and tight sands in the field, wells did not perform satisfactorily. So the operator elected not to attempt to make a well.

Assurance of another major extension of production is given in a well being drilled by L. O. McMillan on his Wells lease a half mile north of the field's present most westerly well and 1¾ miles west of other development. It has logged more than 16 ft. of net oil sand in cores at 10,935-59 ft., high enough to make a well.

Two significant long stepout tests now are drilling. One, being drilled by Fairchild & Sellers with Gulf Coast Drilling & Exploration, Inc., as contractor, is 2 miles southwest of the field. (It is not shown on the accompanying map.) The other, by D. A. Biglane and George Harrison with R. E. Williams as contractor, is 2½ miles northeast of the field.

LACT Standards Get API Approval

STANDARDS for lease automatic custody transfer (LACT) units have been approved by the executive council of the American Petroleum Institute's committee on crude-oil measurements.

They now will be submitted, by ballot, to the full crude-oil measurements committee membership and to the petroleum fluid measurements committee for final approval.

Adoption of minimum requirements for LACT systems climaxes a 7-year study by special committees of the API. (OGJ, Dec. 7, 1959, p. 76). Both the measuring-tank and the positive-displacement-meter systems are recognized by the new API rules.

Under the specifications:

. . . The tank-type system fulfills minimum requirements of volumetric accuracy if the tank is calibrated under API standards 1101. An exception is made for tanks in sizes above 100 bbl. These will be calibrated with any API approved methods. Results of water calibration shall be corrected by the appropriate adhesion factor as set out in recommended practices and procedures.

. . . The positive-displacement-meter system meets minimum requirements if it follows API standards 1101. Frequency of periodic provings and the degree of agreement between them are subject to mutual agreement of the parties involved.

The API measurements committee expects later this year to adopt a detailed set of recommended practices and procedures for LACT operation.

Weekend "Coasting" Cuts Field Costs

• Companies are learning they can let producing wells operate without any weekend or holiday checks. They're saving sizable sums, and experience shows that the risks involved are negligible.

Merle Blakely
District editor

A SYSTEM of "coasting" weekends—leaving producing wells unattended one day a week plus the eight generally recognized holidays a year—is saving oil companies hundreds of thousands of dollars in gager, pumper, and transportation expense.

It has not affected safety of operations, nor producing efficiency.

No men, in most instances, have been laid off. The relief pumpers merely stay with roustabouting and other regular field work.

A few companies, pleased with results, are expanding the unattended time of wells in some areas to two days weekly.

Biggest value of the "free wheeling" system is that, in saving this expense, the economic limits of many leases are extended indefinitely.

This one factor alone—which could make fields with wells producing not more than one-half barrel daily each still economically feasible to operate—works a two-fold benefit:

... It adds hundreds of thousands of dollars, perhaps more, to the income of oil companies and to royalty owners and lease holders.

... It lengthens the working assignments of pumpers 2 to 5 years on leases which, without the staggered system, would be shut down and the wells abandoned.

Cases in point . . . One large Mid-Continent producer has found real money in the system.

In Kansas last year it saved about $36,000 by coasting. Some 700 wells were involved. There was not a single mishap.

Approximately $30,000 was saved in Oklahoma by use of the system. At the present time, 95% of all of this firm's wells coast the holiday checks and from 75% to 80% of all wells are subject to the one-day a week coasting program. It also is using the device successfully in its Texas operations.

Here's how savings come about.

If a pumper receives $2.68 an hour, the cost for a relief worker for 52 days a year plus the 8 holidays would be $1,280. Transportation expense, counting 50 miles a day as an average, would approximate $240. Sunday and holiday wage rates add to the cost.

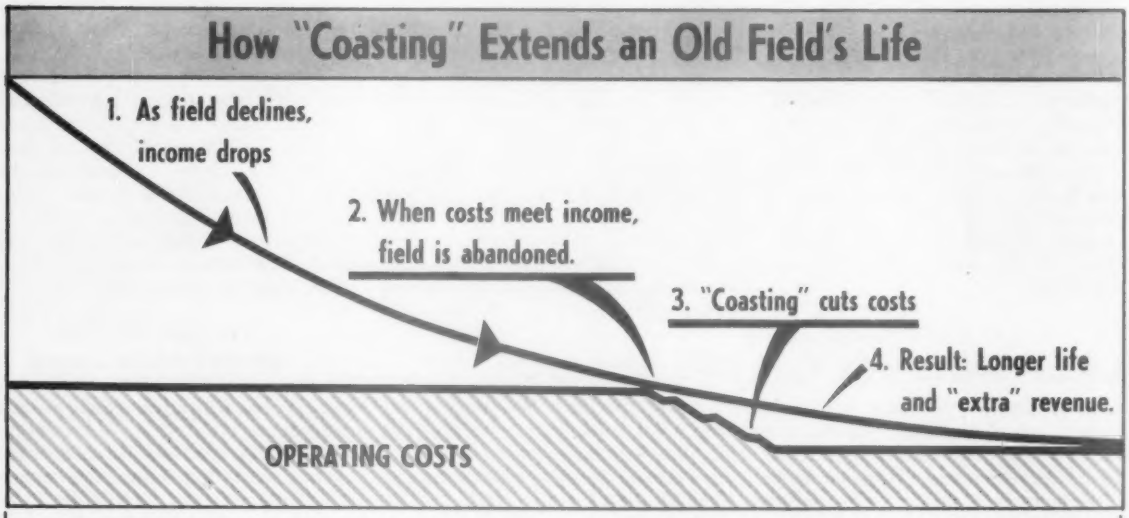
Change gradual . . . Years ago companies believed that, particularly in populated areas, it was necessary to maintain 24-hour checks on producing wells.

The first move toward savings came when a few companies did away with the morning tour—the pumper who checked wells from midnight to 8 a.m. The foreman or superintendent, in many cases, feared abandonment of this shift and at first on his own went out to check wells at day-break.

Next, the shift from 4 p.m. to midnight was dropped in many fields—and there was no dip in efficiency nor production. The one 8 a.m. to 4 p.m. shift handled the gaging and checking of wells.

About 2 years ago, the impetus for coasting holidays and one day a week gained momentum. Now, several majors are permitting three-fourths of their wells to operate unattended one day a week.

Companies which are using the


How "Coasting" Extends an Old Field's Life
1. As field declines, income drops
2. When costs meet income, field is abandoned.
3. "Coasting" cuts costs
4. Result: Longer life and "extra" revenue.
OPERATING COSTS

In older fields there are many marginal wells. The saving resulting from "coasting" often makes the difference between an economic operation and abandonment. The lowered operating costs not only can extend the life of these leases but can make it possible to keep some leases on production until they can be converted to secondary recovery. Result: Greater total recovery, additional income. Pumpers get a break, too. Their jobs continue without necessity of a transfer.

coasting system, in varying degrees depending on locations and conditions, include Phillips, Shell, Pan American and the Carter division of Humble. There are others.

Labor unions have not opposed the free-wheeling practices, according to foremen. Pumpers have not been dropped from the payrolls. There is another advantage. Foremen, not on an hourly wage basis, formerly had to be available 7 days a week to receive gaging reports. Now, they get the day off. Companies and labor unions alike approve of this. It isn't a money saver but it gives a supervisor the leisure to which he is entitled.

Some are wary . . . Some production superintendents still are emphatically opposed to this coasting business.

"You're taking a big chance, tampering with production, which is your life blood," said one. "One small accident and your savings for a year go out the window."

They feel that even with the latest fail-safe devices and with automation and electrification, a daily check on operations is reasonable insurance and a practical, low-cost safeguard against major losses through equipment failures.

As a general rule, Tidewater and Skelly production men lean to the philosophy of checking producing wells every day. There are some fields where wells are on time clocks and are shut in automatically, saving pumpers the checking trip. But pumping wells are not left unattended over a 24-hour period.

What are hazards? . . . Advocates of coasting cite actual experience of loss-free operation to support claims it is good business.

Pumpers usually check the stuffing box, the water level and lube oil in engines, heaters, separators, tank batteries, inspect for leaks or overflow dangers, and examine general appearance of the location.

Tanks can overflow and engines fail and cause trouble. But, coasting advocates point out, these things would happen anyway and it's unlikely they would occur while a pumper is at a well or lease site. A flow-line leak or an engine burnout, even on an unattended day, would represent a minor loss, they say.

Town-lot problems . . . Some companies operating in the city limits and in heavily populated areas in California, such as Long Beach, view with alarm any thought of abandoning the 3 to 6 times a day, 7-day-a-week well check.

With some wells within a stone's throw of residences and others on movie lots and near boulevards with heavy traffic, companies insist daily checks of operating conditions are a must.

However, one coasting advocate states frankly: "They are out of their minds if they don't take advantage of these savings." He points to backyard wells, to wells on hospital and public building grounds in other states which have been operating successfully with unattended periods from 24 to 48 hours. There have been no kickbacks from residents or city officials, he says.

Another production official put his philosophy of coasting this way:

"We found that in back years, we were paying for a lot of attention our wells were not getting and that we also were paying for a lot of attention that was not necessary."

Japanese Firm Joins Alaskan Venture

JOINT exploration effort in Alaska will be launched this year by Polaris Exploration Co. of Anchorage and the Teikoku Oil Co., Ltd., of Tokyo.

The program calls for initial expenditure of $1,250,000 for geophysical work and drilling the first well.

Geophysical work is scheduled to begin in August or September. Drilling on the first well will start before the end of the year. Prospecting will be concentrated at first in the southern section of Alaska, beginning in the Kenai Peninsula-Cook Inlet region.

Grimes said all the work will be conducted by a new corporation yet to be formed. This complies with federal law requiring that foreign companies establish an American corporation to operate in Alaska.

Polaris will act as operator for the work. Global Exploration Co. of Colorado will serve as consultants for the new firm. Work will be done by American employes or American contractors.

The Polaris-Teikoku deal calls for Teikoku to import all oil produced into the Japanese market. Teikoku is one of Japan's largest oil firms, producing more than 90% of that nation's domestic crude oil.

INDUSTRY BRIEFS . . .

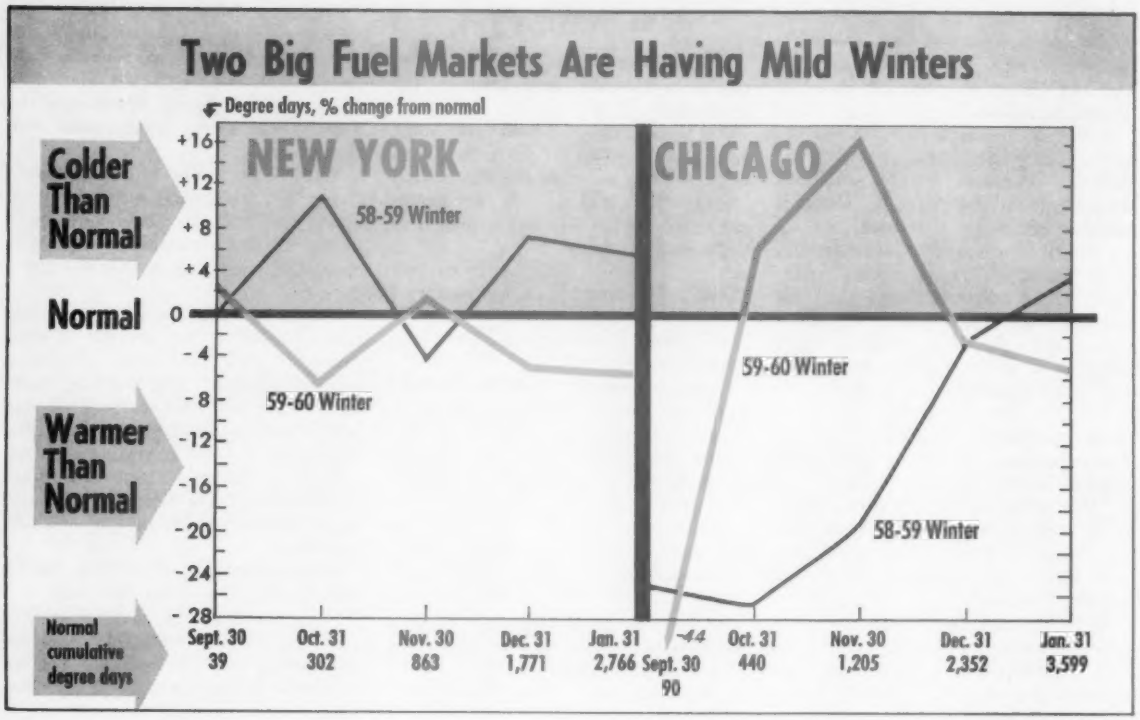
The California Co. will ask the U. S. Supreme Court to reverse a Colorado Supreme Court ruling upholding a Colorado state severance tax on oil and gas production. H. C. Teasdel, Calco president, says an appeal may take 2 years and in that time taxes paid could reach $25,000,000. The law requires a 2% tax on oil and gas produced in Colorado up to $25,000, with a graduated scale upward to 5% on production grossing more than $300,000. Pure, Texas National, and Tidewater also have filed suits attacking the tax.

Oklahoma oil allowables for March last week were cut from 22 to 18 bbl. daily per well by the Oklahoma Corporation Commission. March production will average about 532,000 bbl. daily, compared to 555,000 to 560,000 bbl. in February. The 4-bbl. cut is the biggest reduction since June 1957. The commission rejected a recommendation by two companies that allowables in a pool be set at the lowest volume taken by any one producer.

Merger of Pacific Natural Gas, Longview, Wash., with Cascade Natural Gas, Seattle, has been proposed. Pacific Natural stock would be exchanged on a share-for-share basis for Cascade stock. The transaction is subject to approval by shareholders of both firms.

Daily production allowables for New Mexico's two producing districts have been cut for March. The New Mexico Oil Conservation Commission set a basic daily unit allowable of 36 bbl. for the southeastern New Mexico area, compared with a 35-bbl. allowable during February. For the San Juan basin of northwestern New Mexico, the allowable is set at 60 bbl., compared with 63 bbl. for February.

A libel suit brought by Standard Oil Co. (Ind.) against the Mandan, N. D., Local 725 of the International Union of Operating Engineers is being dropped. Indiana Standard filed a stipulation in U. S. District Court in Bismarck, N. D., to dismiss the action which grew out of a strike by the union at the Mandan refinery. The company asked for the dismissal after the union issued a public apology "for any false impressions our statements might have created . . ."



Refiners Need Weatherman's Help

• Above normal temperatures have helped build up a big supply of distillates and kerosine. Cold weather would help trim these stocks. But cold weather alone won't do the job—refiners need to cut runs, too.

THE CURRENT soft market for heating distillates and kerosine can be laid to two causes: The warm winter of 1959-60 and failure of refiners to throttle down their runs.

About one-third of the blame lies with the weather and two-thirds with refiners, according to a special study made by Ted Gilbert, economist for Shell Oil Co. in New York.

These two developments—the warm weather and high runs — worked together to result in heavy stocks at the start of February. The level of intermediate stocks (distillate and kerosine) early in the month was 145.8 million barrels. This was 33.1 million barrels or 29% more than a year ago and 30.8 million barrels more than the desirable level.

Desirable level is the April 1-November 1 average inventory reported by major companies as ample to meet demand. The majors make these reports to the Texas Railroad Commission.

These high stocks led to price uneasiness. No. 2 fuel has been whittled down twice in the month and kerosine once.

The current Gulf Coast low cargo price for distillate of 8 cents a gallon is 1.875 cents a gallon less than a year ago. Tulsa price for northern shipment of 8.5 to 8.75 cents a gallon is 1.5 to 1.75 cents a gallon less than a year ago. Kerosine is holding up better than No. 2 at the Gulf. It currently is 9 cents a gallon, or 1.375 cents a gallon less than a year ago. But firm demand stemming from greater use as jet fuel has returned kerosine to its old status of 1-cent higher than No. 2.

The net result of weaker prices to refiners is a 28-cent drop in their gross realization from a barrel of crude.

Distillate prices at the tank-wagon level are not off so much as the cargo lots. Discounts, however, are sizable due to the battle by distributors to maintain volume. Posted prices per gallon in significant cities on February 11 for 3 years show:

	1960	1959	1958
New York	11.5c	15.4c	14.4c
Chicago	14.6c	15.4c	14.6c
Boston	15.0c	15.9c	15.0c

The weather . . . It's easy quickly to calculate how the warm weather has hurt fuel-oil demand.

Degree days* for the period of September through January on a U. S. weighted basis were only 123 short of normal. Intermediate heating-oil demand amounts to about 85,000 bbl. per degree day. Thus, the warm weather affected demand and inventories by about 10.5 million barrels. That is one-third of the inventory excess.

The other two-thirds excess of about 20 million barrels can be attributed to excess production on the part of the industry. This can be clearly shown in two ways.

First, the intermediates inventory on November 1, 1959 was 17.6 million barrels higher than the year be-

*Degree days are figured from September through May on a cumulative basis. A degree day is added for each degree below 65° that the mean temperature of a 24-hour period averages.

fore and 14.2 million barrels over desirable. At the beginning of 1959 inventories were 4.5 million barrels below normal.

Second way of looking at the excess is on an annual basis. In the face of no gain in demand in 1959 over 1958, the industry ran 350,000 bbl. daily more crude than in 1958 and had an intermediates yield of 27.1% against 26.6% for 1959. While part of the increased intermediates output of 130,000 bbl. daily was needed, the excess production amounted to 55,000 bbl. daily or 20,000,000 bbl. for the year.

A warm up . . . Warm weather, of course, helped the refiner into the sizable excess inventory position.

Weather during the winter of 1959-60 was quite different than the previous winter. For example, November 1959 was considerably colder than normal and November 1958 was very warm. December 1959 unfortunately was much warmer than normal while December 1958 was extremely cold.

The cold November 1959 did not help the oil industry as much as it should because inventories were well above normal at the start of the month. Then too, the 70 extra degree days above normal in November were more than offset by a shortage of 147 degree days in December.

January weather this year continued to seal the industry's fate. On a U. S. weighted basis, the weather was 6% warmer than normal and 10.5% warmer than last January.

The Midwest made the poorest showing, being about 8% warmer than normal and 17% warmer than January 1959. Early February has added another millstone. Degree days for the first half of the month in New York were 84 less than normal.

The West Coast has fared much better. Degree days through January have averaged 2,811 or 2.1% more than normal and 20% more than last winter. However, only 5% of the industry heating demand is in this area.

Uncertain . . . The refiner, actually, should not count on so-called "normal" weather.

Only three of the 14 years since World War II, for example, were colder than "normal" in New York. "Normal" is 5,050 degree days. Coldest season was 1955-56 with 5,340 degree days while warmest season was 1953-54 with 4,431 degree days. Actual average for the 14 postwar seasons was 4,809.

This means that on the average there was a shortage of 241 degree days every year. This shortage or difference is equivalent to over 20 million barrels of demand. At the end of the season this amounts to a sizable excess carry-over on top of a desirable level of 86 million barrels.

Anyone who gears his supply to the postwar average should be in excellent shape. For example, weather in New York through mid-February this season is warmer than normal but not much out of line from the actual postwar average.

Change in demand . . . Demand has followed the weather pattern by months, although to a varying degree.

In November when degree days showed a 23.9% increase over the same month the year before, demand for intermediates increased 13.1%. In December when degree days dropped 25.6% from the year-before period, demand eased off 16.8%. For the September-January period degree days declined 7.9% and demand was off 5.6%.

On a cumulative basis the correlation between degree days and demand this winter and last is excellent. Heating-oil demand during the September-January period accounts for about 80% of total demand for intermediates. Thus 80% of the 7.9% shortage in degree days would indicate a deficiency of 6.3% in demand. The decline actually was 5.6%.

November demand also did not increase as much as the degree-day data. This is due to a lag in the effect of weather on primary shipments. This also showed up in December when primary demand was not as poor as indicated by the weather.

The outlook . . . Chances are very poor that intermediate inventories will drop to 99.4 million barrels by April, the same level as last year.

The desirable level for that date has been 86 million barrels—68 million barrels of distillate and 18 million of kerosine.

Three developments are needed for such an inventory drop:

. . . Refiner to keep runs below 8,000,000 bbl. daily.

. . . Yields of intermediates to drop 2 percentage points from the February-March 1959 level.

. . . Weather to be 6.5% colder than normal. This would be 213 degree days more than normal. However, for the February 1-14 period New York had 84 less degree days than normal, indicating the weather isn't cooperating.

Actually the prospects are that demand will not increase in February and March and supply levels will be kept at the minimum, resulting in April inventories of about 117.4 million barrels.

This is 18 million barrels more than a year ago and 31.4 million barrels more than desirable, a sad ending to a poor winter season.

If the refiner corrects the left-over winter excess of intermediates during the second quarter of 1960 by reducing runs, he may improve the outlook for gasoline and recover some of his lost profits.

How weather affects distillate stocks

(58-59 Winter vs. 59-60 Winter)

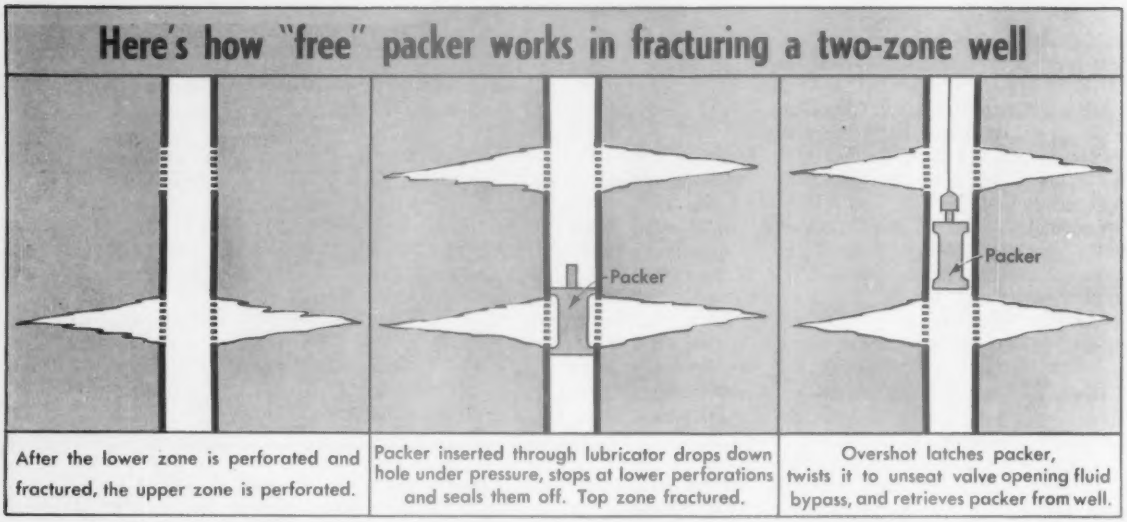
	Weather	Month-end inventory (million bbl.)	Stock decline (million bbl.	Days' supply
1959-60 Winter				
Oct. 31, 1959	.....	214.2	....	75
November 1959	Cold	201.8	12.4	67
December 1959	Warm	175.5	26.3	55
January 1960	Warm	151.5	24.0	48
1958-59 Winter				
Oct. 31, 1958	.....	196.6	....	72
November, 1958	Warm	193.3	3.3	66
December, 1958	Cold	151.1	42.2	49
January, 1959	Cold	117.9	33.2	38

How Indiana Sees Stocks

CHAIRMAN Frank O. Prior of Standard Oil Co. (Ind.) says even extremely cold weather during the remainder of the winter will not "bring about any substantial improvement" in the excessive inventory of heating oils.

"On the other hand, gasoline inventories are in reasonably good shape, particularly in the Middle West," Prior says. "Stocks are about in line with forecasts of summer demand."

During February, Indiana Standard has cut runs 54,000 bbl. or 8% below the January level. Prior says runs will be trimmed to 88,000 bbl. daily below the January level in March.


Here's how "free" packer works in fracturing a two-zone well
Packer
Packer
After the lower zone is perforated and fractured, the upper zone is perforated.
Packer inserted through lubricator drops down hole under pressure, stops at lower perforations and seals them off. Top zone fractured.
Overshot latches packer, twists it to unseat valve opening fluid bypass, and retrieves packer from well.

New "Free" Packer Passes Field Tests

• No pipe or wire line needed to seat this unconventional packer. Designed by Pan Am engineer, tool promises to cut costs of multizone completions.

AN UNCONVENTIONAL new packer is cutting the cost of completing multizone, slim-hole wells in Louisiana and Arkansas.

The unusual newcomer, now being patented by Pan American Petroleum Corp., is simply dropped down the casing, setting itself in the proper position.

The "free" packer was designed by John Wagner, production superintendent for Pan American at Pine Island, La. It is currently being offered to the industry under a nonexclusive license from Pan Am by Go Oil Well Services, Inc., Fort Worth.

The packer has been used so far in combination perforating and fracturing of roughly 50 wells. Of this number, 42 have been for Pan Am in the tight, shallow Anona Chalk pay in Pine Island field in North Louisiana.

The chalk at Pine Island is topped at about 1,350 ft. and averages 120 ft. thick. Normally, two to three zones are fractured, with individual treatments using as much as 60,000 lb. of sand. Wells normally are slim-holed with either 2½-in. or 4½-in. as the production string. Well spacing in the extremely tight chalk averages between 1 and 2 acres per well.

Of the 42 Pan Am jobs, 37 were in 4½-in. casing, the rest in 2½-in. upset tubing used as casing.

How it works . . . Design of the free packer is quite simple. Prime components are two swab cups separated by a rubber sleeve and a threaded rod or "valve."

The packer is used in conjunction with a small, multishot bullet perforator.

Procedure is to perforate and fracture the lower zone then move up the hole and perforate the upper. The gun is pulled and the packer inserted through a lubricator at the surface while 600 to 700 psi. pressure is held on the tubing or casing.

The packer proceeds downhole until it is directly opposite the lower set of perforations. Up to this point, fluid is still escaping through the lower perforations into the fracture. Once the forward portion of the packer passes these perforations, however, it must compress the hole full of fluid below to move further. Unable to do this, the packer stops and expands, effectively sealing the lower set of perforations.

With these sealed, operator quickly proceeds to fracture the higher zone. If three zones are to be perforated, the same procedure is repeated, using a second packer.

When the fracturing job is completed, the packer is easily retrieved with a conventional overshot fishing tool. Once the overshot is fast to the packer, it is rotated about a dozen times to unscrew the threaded rod or valve. The rod then slips down into a larger chamber and remains there as the packer is pulled. This creates a fluid bypass so that the operator doesn't swab his well when he pulls the packer.

The record . . . The packer has been consistently successful, according to its makers, with difficulty experienced in only a couple of the wells where it has been used.

Trouble was experienced in getting the packer down the casing in one well in Arkansas wherein an operator had used heavy, paraffinic tank bottoms as the fracturing fluid. In another, the packer was misplaced when adequate pressure was not held on the casing.

Go Oil Well engineers feel the new tool will be especially useful in most areas where multizone fracture treatments are required in relatively shallow fields.

Its advantages . . . One of the packer's prime attractions is the low cost. Go Oil Well's price schedule, where it also does the perforating, calls for a charge of $100 for the first packer, $50 apiece for all others. This price includes rental of the fishing tool.

The prices "would be slightly higher," the company says, "if we do not do the perforating." These charges, the company says, are well under half those charged for other conventional packers in the Pine Island area.

Another advantage, Go claims, is lack of hazard, in that the free packer "doesn't have dogs or slips to get hung up in the hole."

The company claims there has been absolutely no trouble to date in fishing out its packer following completion of a fracture job.

Parlez-Vous Prolan? It's Computer "Talk"

- Socony invents specialized language to speed up use of computers.

SOCONY MOBIL mathematicians have added a new dimension to the use of electronic computers. It speeds up and enlarges the scope of computer calculations.

Socony has developed a "process" language to supplement the "mathematical" language for giving instructions to computers. The result is substantial savings in time and money.

Socony's mathematicians have long realized that computers are capable of doing a lot of things they are not called upon to do. This unused potential is there, for one reason, because programers have not yet fully learned how to give instructions or commands in the most efficient way.

Socony moved a big step closer to getting the most out of its computers by devising the new language. This language, called Prolan, is based on terms used by refinery engineers. Prolan is short for PROcess LANguage.

It uses terms that apply to processes or functions of a refinery. It consists of only 11 key words or commands. The use of these relatively few terms has decreased sharply the time needed to give instructions to computers.

Developments . . . Computers can perform almost any mathematical function with fantastic speed. The extent to which this speed can be used depends greatly on the speed with which commands are given. Speedier, or shorter, instructions have been the goal of programers for years.

IBM made a major contribution in this direction several years ago when it developed Fortran. Fortran, short for FORmula TRANslator, was oriented toward mathematical problems. As such, it was of value to computer operators in many fields.

About a year ago, IBM brought out Fortran II. This was an improvement on its predecessor. One advantage was that it made possible a better subroutine procedure. Sub-routines are reusable pieces of information which may be simple but are frequently complex. They are stored on tape for use when needed.

Socony has gone a long step further by developing a language oriented solely to petroleum-refining processes. It can be used to translate equations, formulae, etc., into a form which a computer can absorb.

DEMONSTRATING the great difference in word volume between use of Prolan and ordinary machine language are Socony mathematicians Robert A. Eimer, left, and John S. Hicks. The small stack of paper held by Hicks contains instruction in Prolan which, when translated in regular computer language, add up to the stack of commands in front of Eimer.

Prolan is completely compatible with machine language which is normally used and also with Fortran.

Key words . . . The 11 commands used in Prolan are: List, load, limited load, unload, limited unload, commitment, yield, tolerance if, set up iteration, start, and finish. List, for example, covers certain stocks in preferential order.

The list command creates a predetermined set of feed stocks to be loaded or charged to a unit. The load command records the amount loaded, at the same time subtracting an equal amount from other units. The other commands govern subsequent steps.

John S. Hicks, the Socony engineer who was chiefly responsible for the development of Prolan, estimates that its use reduces the number of commands from 100 in normal "machine language" to one in Prolan. Because of the complexity of giving commands to computers, Hicks estimates that the cost of a single command can range from $1 to $4.

Giving commands is complicated by housekeeping and debugging. Housekeeping is insuring that instructions are orderly. Debugging is checking for and eliminating errors in instructions. Since programers are generally well-paid personnel and since computer rentals are high, the cost of a single command mounts up.

Hicks spent about a year developing Prolan. He was well under way with the project when Fortran II came out. Fortran helped cut the number of commands to roughly a tenth of what they had been. Prolan, in turn, reduces the number even further.

Socony is using Prolan on an IBM 704. It is not a substitute for linear programing, which Socony has been doing for 5 years. While it can serve as a supplement to linear programing, it is particularly useful in determining the performance and operating costs of a new refinery or a new unit or in sizing up the prospects of a new product in an existing plant.

Adena Field Gets New MER

THE COLORADO Oil and Gas Commission has ordered a new MER for the Adena field. This action came as the result of a hearing on the application of The Pure Oil Co., operator of the Adena "J" Sand Unit.

Based on a reservoir engineering study, the MER has been increased to 20,000 bbl. of oil and 25,173,000 cu. ft. of gas per day. The old figure called for a maximum daily oil production of 18,000 bbl.

Reason for the change is the effectiveness of the water flood started early in 1957 (OGJ, Mar. 4, 1957 p. 74 and Apr. 29, 1957 p. 116).

The order, which becomes effective March 1, does not change the participation formula for the unit.

CATC Decision Alters FPC Philosophy

- **Commission chops Aneth field gas to 17.7 cents, explains that it must now consider initial price, justified by "substantial" evidence, before it can approve a company's application.**

THE FEDERAL Power Commission last week granted permanent certificates to 17 independent producers for the sale of 100-million cubic feet daily of natural gas from Aneth field to El Paso Natural Gas Co.

But the FPC trimmed the proposed initial price of 20 cents per thousand cubic feet to 17.7 cents.

The decision was an example of the impact on the commission of the Supreme Court's decision last year in the CATC case.

The nub of that decision was the FPC must consider the cost of the gas as a factor in passing on initial certifications. The court held that the initial price must be supported by "substantial" evidence to show that it is required "by public convenience and necessity, and is in the public interest."

Up to that time, it had been the general practice of the commission to approve certificate applications without giving great weight to the initial prices. The challenge to price came, if at all, in subsequent rate hearings.

New attitude . . . Now, however, the commission majority feels that it is bound by the court's decision to consider whether an initial price is "out of line"—a question calling for comparison with other prices.

Furthermore, in the opinion of the commission, the CATC ruling makes it necessary for the FPC to include the question of whether the conditioned price will hold the line by preventing general price rises and prevent increases in the pipeline purchaser's existing rates.

Finally, the FPC said last week, it must also consider whether there is a public need for the gas, and—where called for—evidence of costs.

Working with these CATC guide lines, the FPC ruled in the El Paso case that El Paso and the producers selling to it had failed to justify a 20-cent price.

The arguments . . . El Paso had used this line or argument:

It had arrived at the price through arms-length bargaining with the producers; the proposed price would not trigger higher prices on other Aneth sales made at other prices, nor would it affect prices paid by El Paso on gas supplies delivered in the San Juan basin, some 75 miles away in northwestern New Mexico.

But the FPC struck down the arguments in this fashion:

It said that, in view of the CATC decision, evidence of arms-length bargaining wasn't enough.

It said that certification of the proposed price would tend to increase prices in the general area and in the San Juan field. Certainly, said the commission, if it approved a higher basis, or floor, from which future negotiations would be conducted, this might bring about an increase in El Paso's rates.

To cap its arguments, the commission also said that El Paso's cost evidence on San Juan gas did not sustain the 20-cent price.

The FPC justified its own 17.7-cent price in this way: Indications are that the weighted average wellhead cost to El Paso in the San Juan basin was 11.69 cents. Adding a subsequent 1-cent and 5.001 cents for processing to put the San Juan gas on a comparable basis with Aneth gas, the total would be approximately 17.7 cents.

Dissenters . . . Commissioner Arthur Kline was reluctant to go along with the majority, even though he did so.

He said there was so little evidence the commission could not really determine whether the proposed price of 20 cents was fair or not. He said a 15-cent or a 22-cent price could be supported "with as much facility" as the 17.7-cent or 20-cent price. In other words, he indicated it was a guessing game.

He said that the "only choice" was to consider the evidence as it was presented and try to fix a price until such time as a proper rate has been arrived at in a rate proceeding.

Commissioner John B. Hussey, now back at work after a long illness, was the lone commissioner who entered an outright dissent. In his opinion, the evidence showed that the 20-cent Aneth price for gas already gathered, compressed, and processed was less than the wellhead price in California and less than El Paso's cost of producing pipeline quality gas in San Juan field.

He noted that the president of El Paso had testified that the Aneth contract price would not increase the company's cost to its California customers, and that no rate increase would be filed because of it.

He said, too, that the proposed Aneth price would not trigger favored-nation escalations in other contracts, and would not increase El Paso's cost or create higher prices at either the producer or consumer ends.

El Paso and the producers selling to it had been granted temporary certificates in November 1958. These certificates, however, were conditioned to require that the producers refund to El Paso any amounts in excess of those resulting from the rate finally allowed by the FPC.

Therefore, as a result of last week's action, the producers will now have to make those refunds. They will have 90 days in which to do so.

New Denver Price War Trial Ordered

A SUIT which arose as the result of a gasoline price war in the Denver area late last year is back in Denver District Court.

Oriental Refining Co.'s suit against most major distributors of gasoline in the Denver area—charging they unfairly cut prices—will be tried before District Judge Edward J. Keating. In a decision this month, the Colorado Supreme Court upheld the constitutionality of the Colorado Unfair Practices Act.

Judge Keating had dismissed Oriental's suit and request for an injunction to end the price war, holding that the act, which forbids doing business below cost to destroy competition, is unconstitutional. But the Supreme Court held, 4-2, that the act is constitutional, and remanded the case to Judge Keating for trial on its merits.

The price war has ended in the meantime. During the battle, prices dropped to as low as 19 cents and some independent stations closed down until prices returned to normal. Keating has not set a new trial date.

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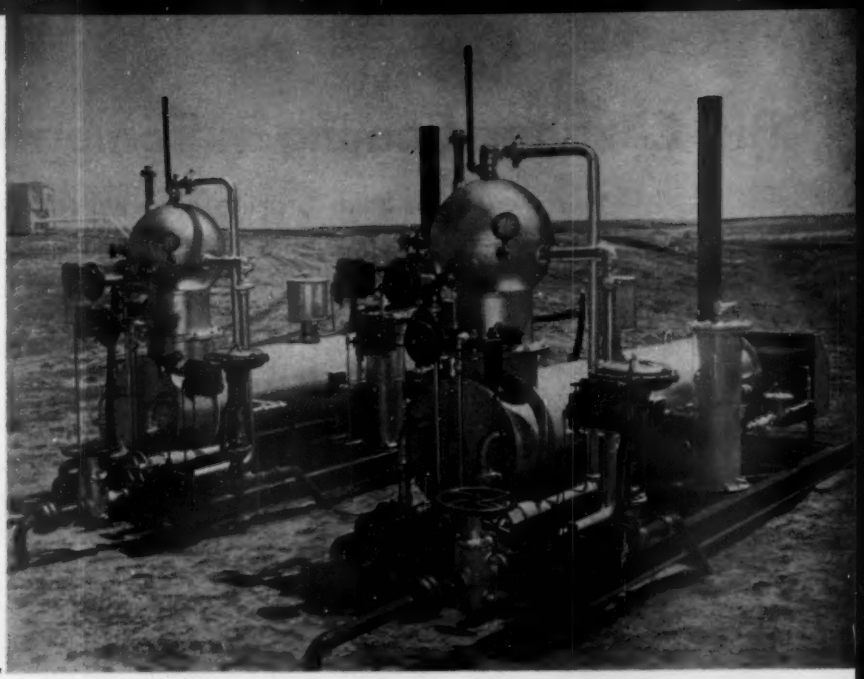

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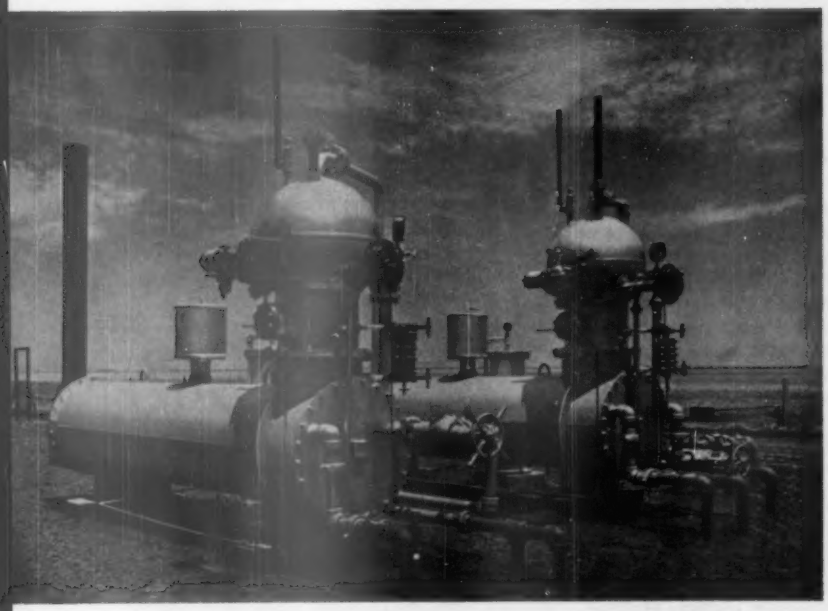

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Big Changes Coming in Tomorrow's Refinery

• Isomerization holds promise of a major advance in refining, Socony research man says; additives and multiple use catalysts may bring a new era of process technology, Du Pont man believes. Both see major future changes.

ISOMERIZATION looms increasingly important in the immediate future of petroleum refining.

This was foreseen by two speakers at an American Chemical Society petroleum symposium in Philadelphia last week.

W. J. Borns, director of research planning for Socony Mobil Oil Co., Inc., expressed this view:

"We are perhaps on the threshold of another major advance in refining. Normal and slightly branched pentanes and hexanes are susceptible to octane improvement by a number of isomerization processes."

John R. Sabina, planning manager of Du Pont's petroleum chemicals division, was a bit less positive:

"We believe a flexibly designed catalytic reformer will be the backbone of tomorrow's refinery. In addition, alkylation, isocracking processes, and isomerization will also be used, particularly if reduced sensitivity is desired."

60% gasoline? . . . Sabina, speaking on trends in automotive fuels, said that we are now in an era when "the octane quality of premium fuels is increasing at a considerably faster rate than are car requirements."

Currently, he added, average available premium satisfies about 90% of the new model cars. Average regular, however, satisfies considerably less than 50%.

After listing the process changes and equipment additions he sees coming, Sabina foresaw a typical refinery operating at a gasoline yield of 60% with a ratio of 35% premium to 65% regular.

Coming processing changes will cause appreciable changes in the properties of both regular and premium, he said. Sensitivity, for example, which increased in premium by two units from 1950 to 1958, has begun to decline and will continue to do so.

Conversely, as the sensitive elements are removed from premium and go into regular, a continuing upward trend in sensitivity is anticipated for regular.

Sabina foresees not only increased use of tetraethyl lead as octane numbers go up, but also the use of antiknock compounds that are peculiarly effective with certain hydrocarbons.

"With aromatics at a high level and with even higher concentrations ahead, tetramethyl lead will undobutedly find a place in the fuels of the future," he said.

While TML is chiefly effective with aromatics, methyl cyclopentadienyl manganese tricarbonyl has its maximum effect on highly paraffinic fuels. Therefore, the addition of these two materials should, Sabina feels, "be a definite advantage."

He drew this picture of one of the perplexing problems facing refiners. Surface ignition and hot starting noise are two of the undesirable conditions arising from increases in compression ratios.

Certain aromatic hydrocarbons of very high octane quality are among the worst offenders in the area of surface ignition. Paraffinic fuels, on the other hand, are prone to encourage hot starting noise. While aromatics contribute to surface ignition, they have been effective in suppressing hot starting noise. Such conflicts, he said, "severly limit the refiner in making the best gasoline at minimum cost."

Long-term view . . . While Borns sees isomerization important in the refinery of tomorrow, he foresees vastly greater changes in refining the day after tomorrow.

"Possibly more than anything else, additives and catalyst polyfunctionality are likely to be the keynote to a new period of refining technology," he said.

These are some other predictions Borns made for the more distant future:

. . . Integration of process units into fewer control and operating points. Automation and computer control will be big factors here.

. . . Product quality. Holding product quality near specifications may, in time, be done very well with automatic devices. Giving away product quality just to be on the safe side will be much less justifiable in the computer-controlled refinery.

. . . Maintenance. Process unit runs of 4 or 5 years are foreseen as highly desirable by refinery experts. Refinery managers would like to bring units or whole process areas down for maintenance when it suits business.

. . . Inspection. Engineering features which permit complete unit inspection while in operation are almost sure to be required.

. . . Overdesign. Refiners will be on the lookout for ways to avoid expensive over-design. This evil has two bad effects. The first is obvious waste of capital. The second is the hidden overcapacity in the unit, the use of which is almost irresistible.

. . . Greater flexibility than current refinery processes offer is important. On gasoline-to-distillate ratio itself, hardly any refiner can avoid accumulating inventories to meet variations in seasonal demands. Here is an opportunity for major improvement in refinery processes for the day after tomorrow.

. . . Minimum cost. Refinery processes need to be developed so that they can be designed at an investment saving to operate in a definable range of minimum cost. Much of our equipment can handle incremental throughput at lower cost than base throughput. This creates another irresistible temptation to overproduce.

. . . Additives. Greater use of additives will make it possible to produce new or premium products with special quality features. The additive route gives flexibility and reversibility which would permit a much bolder approach to new products.

PIPELINE

A 59-mile 36-in. purchase lateral is planned by United Gas Pipe Line to take gas from Bastian Bay field, Louisiana Gulf Coast. The project in the South Louisiana marsh would cost $17 million. United bought the gas from Gulf Oil and Tidewater, whose acreage holds some 700 billion cubic feet of the 2 to 3 trillion-cubic foot reserve. United and the producers are asking FPC to approve a record interstate price for Gulf Coast gas of 22.5 cents, plus tax reimbursement (OGJ, Feb. 1, p. 61).

A 110-mile gas line, costing $3,000,000, from the Lac La Biche area of Alberta to Edmonton is proposed by Northern Alberta Pipe Lines, Edmonton, a newly organized firm headed by Blake A. Sage. The company has applied to provincial authorities for

Imperial Has Promising Goose River Strike

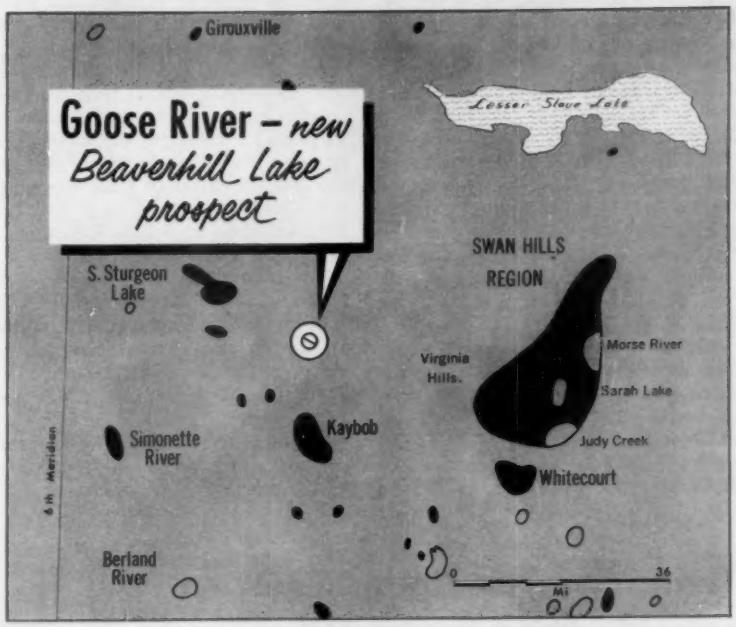
A SIGNIFICANT west extension has been made to Alberta's vast domain of oil wells producing from Beaverhill Lake Middle Devonian formation.

Latest apparent discovery is Imperial Oil's 2-1-67-19 Goose River, 35 miles west of the main producing area at Swan Hills.

There is no confirmation to the oil find yet. Reports state, however, that 1,456 ft. of oil-cut mud was recovered from the Beaverhill Lake zone during a drill-stem test at 9,129-9,213 ft. The initial test reportedly gave up no water.

Another 120-ft. section is now being opened for further tests. The first test covered an 84-ft. interval.

Imperial's highly important well is located on LSD 2, 1-67 on reservation No. 472. Imperial paid a cash bonus of $515,322.44 for the 10,240-acre tract at the December 1958 Crown sale.



Up the middle . . . If Goose River should prove productive, it would close a middle gap of a big Middle Devonian producing circle in west-central Alberta.

On the eastern perimeter is the huge Swan Hills region with its Virginia Hills, Sarah Lake, Morse River, and Judy Creek fields.

Whitecourt is the southern perimeter and the southwest corner is tied down at Kaybob. The northern Beaverhill Lake producer is off the map at Red Earth Creek, the northernmost producer in Alberta. Several years ago Beaverhill Lake oil also was found at Girouxville far to the northwest, but the well was not completed in that formation.

Other activity . . . The Swan Hills area is by far the most active single region in Canada this winter.

There are more than 80 active locations, either staked or drilling, in the region. The only other single oil region to compare with this on the continent currently is McComb field in Mississippi (See p. 44).

Home Oil Co., Ltd., reported completion of two important wildcats on the 92,000-acre Morse River reservation. The tract lies southeast of the Swan Hills spread.

The 14-32 Morse River well flowed 388 bbl. daily on 22/64-in. choke. The 4-31 Morse River flowed oil during tests equal to the first well.

BRIEFS . . .

permission to construct the 10-in. line and a gathering system in the McMurray vicinity.

The old Pacific Northwest system, now merged into El Paso Natural Gas Co., will be extended in a $10,495,000 program in Washington and Oregon. El Paso has temporary FPC authority to lay 19 miles of 20-in., 41 miles of 16-in., 26 miles of 12-in., and 36 miles of 10-in. from the 26-in. main line in Cowlitz County, Washington, to Eugene, Ore., to deliver gas at Portland, Salem, Albany, and Eugene.

An expansion of 145,000,000 cu. ft. daily is planned for the Cities Service Gas Co. Kansas Hugoton line by installing 29,750 hp. during 1960-62 and development of underground storage in Alden field, Rice County, Kansas. Cities Service will lay 13 miles of 16-in. from Alden field to its Lyons station, 10 miles of 16-in. between Lyons and Hutchinson, Kans., and 9 miles of 16-in. near Wichita. The company's 1960 expenditures will amount to $10,270,000.

A remote-controlled gas-turbine pump station will be installed by Okan Pipeline Co. on its 6-in. LPG line from southeast Kansas to Tulsa. The new station at Goltry, Okla., which will be operated from Liberal, Kans., will have a 1,100-hp. gas turbine operating at 20,000 r.p.m. driving a centrifugal pump at 6,000 r.p.m. Speed reduction will be an integral part of the turbine, which will burn butane. The station will be constructed in late summer.

The added horsepower will raise capacity from 10,500 bbl. daily to 15,000 bbl. daily. Although gas turbines have become common on natural-gas transmission lines, they are still a rarity on liquid lines in the U. S. The only gas turbine now operating on a products line is at Great Lakes Pipe Line Co.'s West Tulsa station.

Also for Pipeliners . . .

IN THE NEWS: Pipeliners will spent $1.1 billion this year with bulk of the outlay going into natural-gas facilities (p. 39) . . . FPC chops Aneth field gas to 17.7 cents per M.c.f. from 20 cents, revealing impact on agency of last year's CATC decision by the Supreme Court (p. 52).

PLUS THESE TECHNICAL REPORTS: Computer speeds M.c.f.-mile study (p. 76) . . . Pipeline construction report (p. 97).

Dallas Company Buys Mecom, Brown Holdings

GENERAL American Oil Co. of Texas, which has set a blistering pace in buying up production in recent years, has completed two more big purchases of individual holdings at a cost to the company of more than $50,000,000.

W. Lewis Perryman, Jr., executive vice president, told the Journal in Dallas last week that the company had signed a contract to buy out John W. Mecom's interests in Mecom Petroleum, Houston, a partnership with San Jacinto Petroleum Corp., for $27,000,000.

Mecom Petroleum's largest properties, all in South Louisiana, are in offshore Blocks 45 and 46 in the West Cameron area; Johnson's Bayou field in Cameron Parish, West Delta Farms field in La Fourche Parish; and in Hollywood, Crescent Farms, and Montegut fields in Terrebonne Parish. Also included were smaller interests in scattered other areas.

The General American spokesman said Mecom's personal holdings outside his interest in Mecom Petroleum were not involved in the deal. The Houston independent thus retained domestic holdings in Lake Washington, Stark Plantations, and Bay St. Elaine fields, plus others in Louisiana and Texas.

Brown deal . . . Perryman likewise confirmed that General American has, for all practical purposes, wrapped up the purchase of producing properties of the Joe W. Brown estate, New Orleans.

General American is a 50% participant in this $46,500,000 purchase of the expansive Brown holdings in South Louisiana's Valentine field. Brown died in 1959.

Actually, the purchase will not be officially consummated until a 40-day waiting period in effect under order of a Louisiana probate court is up.

General American estimates the purchase will net the buyers roughly 20,000,000 bbl. of oil and more than 400 billion cubic feet of gas.

The company is quite pleased also with the Mecom deal. Perryman said it will "balance our production elsewhere with good Gulf crude."

A Houston source had reported early last week that the two purchases together netted the buyers about 125,000,000 to 130,000,000 bbl. of oil and 300-400 billion cubic feet of gas.

Perryman said in Dallas, however, that these figures were not correct. He declined to comment further.

Texas Gas Tax Under Court Attack

COURT TESTING of Texas' severance-beneficiary tax on natural gas is under way in earnest.

Big sacks of documentary evidence are piled up in the 126th district in Austin to back up seven gas pipelines' attack on constitutionality of the levy.

The tax, passed by the legislature last summer, is bringing in more than $1,000,000 a month — with all but about $10,000 a month being paid under protest. It is under heavy attack from pipelines, with more than 90 cases filed in three district courts and a county court.

Stipulations in the consolidated suit have reduced the issues to one—the constitutionality of the tax law. The stipulations represent about 6 months' work between members of the state attorney general's staff and attorneys for the pipelines.

Judge Jack Roberts, who will hear the suit in the Austin court, has set March 7 for filing of any additional briefs. Reply briefs will be heard by April 4. Oral arguments will be heard sometime between April 4 and April 15.

PROCESSING BRIEFS . . .

Construction will begin soon on a 100,000-bbl. per year liquid-asphalt plant at Imperial Oil's Edmonton refinery. The plant, slated to be in operation in June, will supplement Imperial's 280,000-bbl. solid-asphalt plant.

Bay Petroleum, a division of Tennessee Gas Transmission, will enter the petrochemical field with construction of a 2,000-bbl.-daily aromatics unit at its Chalmette, La., refinery. The unit will produce benzene, toluene, xylenes, and heavier aromatics. Construction will begin at midyear, with completion slated in the spring of 1961. To be installed are a catalytic reforming unit, an extraction plant, and facilities for the distillation and separation of individual aromatics.

Dow Chemical will spend $30 million to expand its Plaquemine, La., plant during the next 2 years. Dow expects to complete construction by early 1962. This is the second expansion for the Plaquemine plant in less than a year. Dow started a $12-million program last May. A high-pressure polyethylene plant, a major part of the program, should be in operation this fall. The new program consists of an ammonia plant, and increased capacity for the vinyl chloride, chlorine, caustic soda, and power plants.

United Carbon, which moved from Charleston, W. Va., to Houston last year, will construct three buildings just west of Houston near Addicks. The $2.5-million project will consist of an office building, a research laboratory, and a polymer development facility.

A contract has been let to Ralph M. Parson Co. to build a crude-processing, gas-treating, and sulfur-recovery plant in Alberta's Innisfail field. Innisfail Field Operators Committee, Calgary, awarded the contract. Canadian Oil Companies, Ltd., will be plant operator for a group of 14 companies. The plant will handle 10,000 bbl. of crude and 11,000 M.c.f. of gas daily. It is scheduled to go on stream by November 1.

Also for Refiners . . .

IN THE NEWS: Refiners are on their way to spending $675 million in capital outlays this year (p. 39) . . . Warm winter plus excessive refinery runs have combined to cause industry economic trouble (p. 48) . . . New language—Prolan—will save processors plenty in use of computers (p. 51) . . . Isomerization is expected to get a big play in the future refinery (p. 54).

PLUS THESE TECHNICAL REPORTS: Cat-cracker feed stocks from Middle East crudes (p. 70) . . . Computer control reduces costs, improves quality (p. 87) . . . California Oil Co. saves on cooling tower (p. 93).

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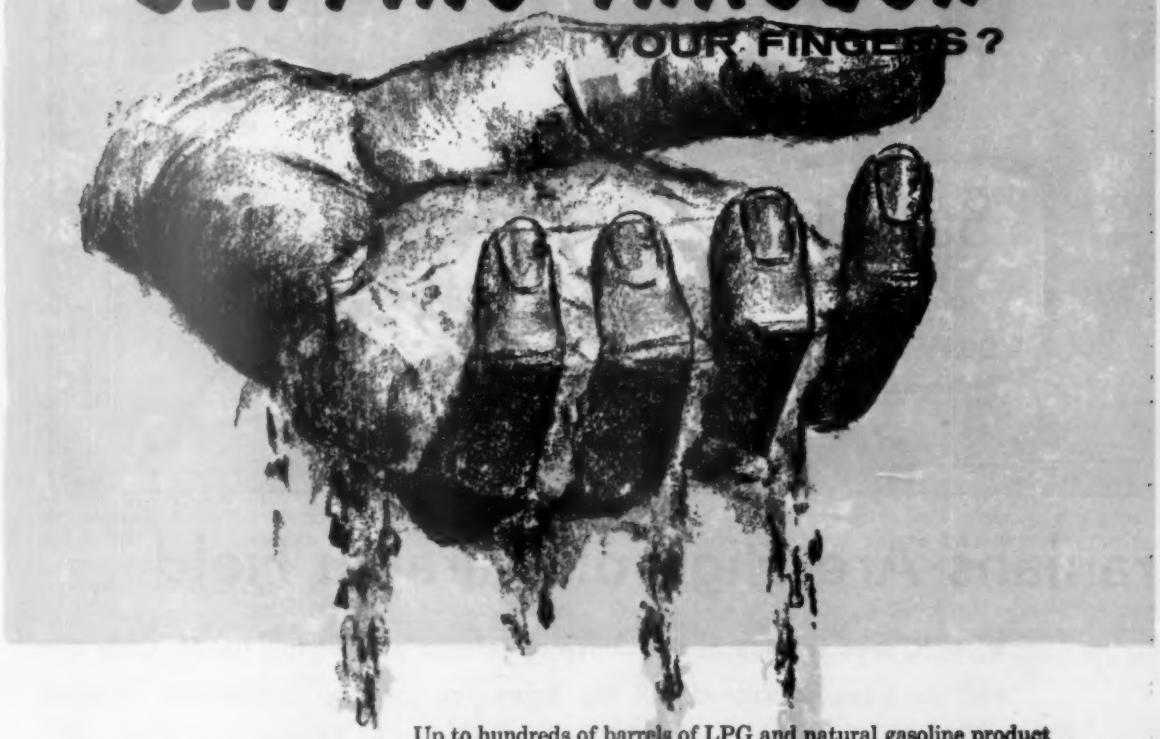

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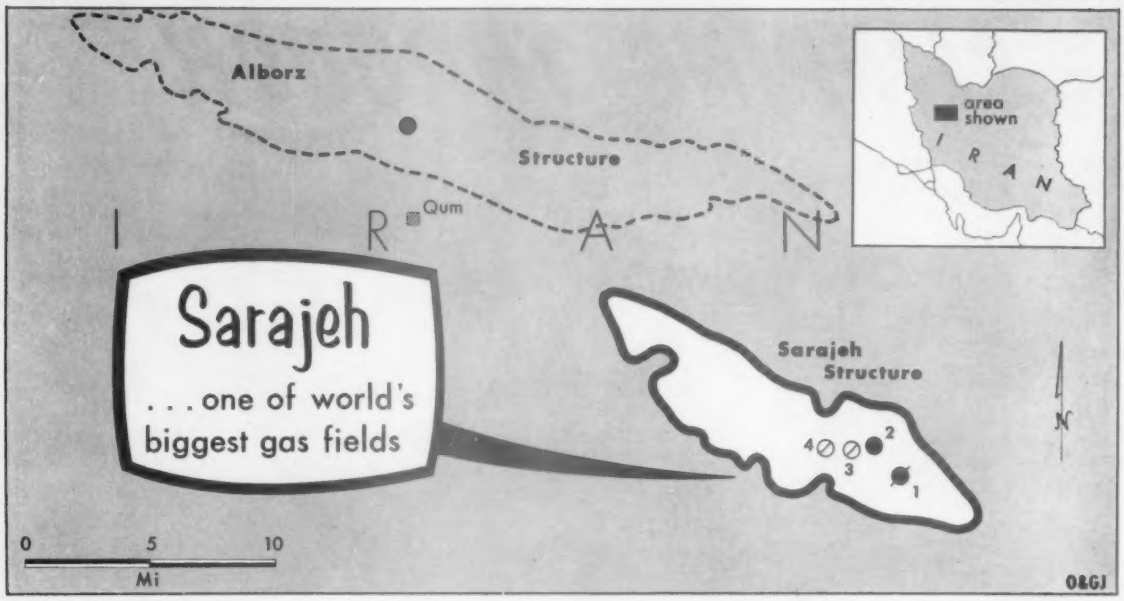


Iranians Are High on Sarajeh Field

• NIOC sees Sarajeh as the source of Teheran's future fuel needs. Only one well has been completed, but big claims for gas and condensate reserves are being made. And a gas line and refinery at Teheran are in the mill.

IRAN last week laid claim to one of the world's biggest natural-gas fields.

Abdollah Entezam, chairman of National Iranian Oil Co., says the field being developed on the big Sarajeh structure about 100 miles south of Teheran has proved gas reserves of more than 7 trillion cubic feet. This would rank it as No. 5 in the world and only a little below the 9 trillion estimated for France's big Lacq field.

The head of the government-owned oil company also said Sarajeh has proved reserves of 40 million barrels of condensate. This would make it the only major liquid hydrocarbon discovery in Iran outside the concession of the international consortium.

Entezam revealed the reserve estimates at a press conference in Teheran when he gave a brief outline of NIOC's plans for the next 5 years. A major item in the plans is moving Sarajeh gas production to Teheran, plus construction of a Teheran refinery to process the field's liquid output.

The NIOC chairman said a new subsidiary company will be formed to exploit Sarajeh. The new company, he said, will include private Iranian capital. The field is now being developed by Iran Oil Co., NIOC's exploration subsidiary.

Entezam gave no engineering details of his reserve estimates for the field. To date only one well has been completed on the big structure just a few miles southeast of Qum on the central Iranian plateau. Two more are drilling ahead well below the interval found productive in the discovery.

Last week Sarajeh 3 was drilling below 10,498 ft. with casing set at 8,359 ft. The other well, Sarajeh 4, was below 11,070 ft. with casing landed at 9,231 ft.

The discovery . . . The careful casing program being followed by the Iranians is a direct result of a near disaster on Sarajeh 1 in August 1958.

A Seacat Drilling Co. crew was preparing to test an Oligo-Miocene limestone encountered at 7,909 ft. when high pressure gas began to break the surface 2 miles from the rig. Geysers "walked" to within half a mile of the derrick before the well could be killed with cement leaving 6,900 ft. of drill string in the hole. That well had only surface casing (OGJ, Dec. 21, 1959, p. 61).

Sarajeh 2 was drilled down structure from the first test and was completed as a prolific gas well. IOC officials estimate it is capable of producing 40,500 M.c.f. of gas daily along with 2,800 bbl. of high-gravity condensate. It has been shut in since completion because of lack of a pipeline outlet for the gas.

IOC had hoped that No. 3 and No. 4 would drill into the limestone formation well below where they assume the gas cap exists. Entezam's reserve estimate last week makes it appear that Sarajeh is a gas-condensate field rather than the oil producer the Iranians really wanted.

A pipeline outlet for the gas to Teheran would be as valuable to the country as if the field produced oil. All products consumed in Teheran, the most populous region of the country, are moved north from the Abadan refinery by a 10-in. products pipeline

system. The line's limited throughput makes it necessary to move all the fuel oil consumed in northern Iran by rail.

A pipeline system to move Sarajeh's gas production to industrial and domestic consumers in the Teheran area would undoubtedly mean a shot in the arm to the economy of the northern region. A refinery at Teheran to process the high-gravity condensate produced at the field would add to its industrial independence of southwest Iran where at present the country's entire oil industry is located.

Coking Plant May Be Built

PLANS TO manufacture a metallurgical coke from southern Monagas state's heavy crude output in Venezuela are under study by Phillips Petroleum Co.

Phillips holds a 56% interest in the southern Monagas wells, which produce crude with gravity ranges from 9 to 14 degrees.

If Phillips decides to begin coke making, a new plant probably would be necessary. It has a refinery at San Roque, but the mountainous terrain between the plant and the Monagas area would make transportation impractical.

The Venezuelan Government is building steel plants at Puerto Ordaz. Coke could be used there for reduction of iron ore. Phillips indicated extensive research is contemplated before a decision will be made.

Austrian Output Off 13%

VITAL statistics of the Austrian oil industry show why the country's leaders are worried about it.

Output slipped 13% last year to 45,800 bbl. daily. This is a drop of one-third in the 4 years since the country regained its fields from the Russians. At the same time, rapidly growing consumption has risen well over 50,000 bbl. daily.

The official reserve estimate as of January 1 was 38,815 thousand tons, or about 265 million bbl. Four years ago when the Austrians agreed to reparation payments of 20,000 bbl. daily for 10 years in order to recover the fields, they believed recoverable reserves were about 660 million bbl.

Net shipments of Austrian crude behind the Iron Curtain were cut from 20,000 bbl. to 10,000 bbl. daily 2 years ago when Russia agreed to ship back 10,000 bbl. daily of its own crude of another quality. But Austrian officials still view shipments of 10,000 bbl. daily for another 6 years as a severe strain.

Refinery Planned in Panama

. . . by Continental and tanker company. It will be Central America's second and by far the largest.

CONTINENTAL Oil Co. is making its first move into foreign refining by joining forces with a leading tanker operator to build what will be Central America's second refinery.

The $30-million plant—a joint venture between Conoco and National Bulk Carriers, Inc., New York, owner of a world-wide fleet of tankers—will be located near the entrance of the Panama Canal.

The refinery, to have a capacity of about 30,000 bbl. daily, will be on Payardi Island, near Colon at the Caribbean Sea entrance to the canal—a strategic location for potential bunker-fuel business.

Central America's first refinery is now being fabricated in Houston. It will be a 4,000-bbl. plant for erection at Puerto Matias de Galvez, Guatemala. It is being built by Breaux Bridge Oil Refining Co. and Royal Dutch-Shell interests (OGJ, Sept. 29, 1958, p. 52).

Conoco and National Bulk Carriers formed Refineria Panama, S.A., a Panamanian corporation which obtained authority of the Panamanian Government to build the refinery on Payardi Island.

Preliminary clearing of the site already has started, and contract for construction will be announced shortly. The plant will be operating by early 1962 with about 200 employes.

Although Refineria Panama released no information on capacity, crude sources, or the type of products to be turned out, it was apparent from the cost that the refinery will have a capacity of about 30,000 bbl. daily, that its principal source of crude will be Venezuela, and that its prime products will be bunker fuel and gasoline.

Although Conoco has no developed crude production sources overseas, the company is developing properties in Venezuela, through 25% interest in Paria Operations, Inc., and in Libya, through one-third interest in concessions being developed jointly with Ohio Oil Co. and Amerada Petroleum Corp.

Guatemala plant . . . Guatemala's first refinery site is hacked out of the tropical rain forests on Guatemala's Caribbean coast. Lummus Co. is starting tank farm dikes in March. Completion of the plant is expected about the end of the year.

The process plant is being packaged abroad into units as much as possible. The prepackaging of the units will ease the shipment and erection problems at the plant. The packaged units will be connected together with field-fabricated piping. The storage tanks are being shop fabricated in France.

The refinery will be owned by Refineria Metias de Galvez, Ltd. Stock ownership of the company is divided 50-50 between the Breaux Bridge group and affiliates of Royal Dutch-Shell.

Processing units will include a 2,600-bbl. Unifiner and a 1,200-bbl. catalytic reformer. It will operate on reconstituted crude from Venezuela.

Petrochem Activity High in Britain

A 70-MILE pipeline for carrying ethylene will be built by Esso Petroleum Co. from Fawley refinery to a new petrochemical development in southern England. It will be the first in England linking a refinery with a petrochemical plant over a long distance.

The company is seeking permission from various authorities to lay the line to Severnside, where Imperial Chemical Industries plans to build a $14 million, 35,000 tons per year ethylene oxide and ethylene glycol plant.

Esso hopes to complete it by the end of 1961.

Esso also will start work soon on a new unit to supply additional ethylene for the pipeline, as well as butane and propylene. The unit will be the largest item in a $15-million expansion at Fawley.

The related Esso and ICI projects are the latest additions planned for Britain's burgeoning petrochemical industry. ICI alone is bringing two other major projects on stream later this year. These are facilities to produce an additional 15,000 tons of polythene and 15,000 tons of "Terylene" per year.

Two other major projects will open this year. These are a 7,500-ton maleic anhydride plant being built by Monsanto at Newport, and a 20,000-ton ethylene derivative plant going up at Hythe for Union Carbide.

Labor Peace Assured in Venezuela

• Five more companies follow the lead of the country's Big Three by signing a 3-year labor contract. Everyone but Communists is happy over settlement.

FIVE MORE companies last week followed the lead set by Venezuela's Big Three and signed new 3-year labor contracts as the whole country heaved a sigh of relief.

Throughout the 5 months of talks between Fedepetrol and the oil companies, the potential threat of a crippling oil strike hung over the Venezuelan economy like a big sword of Damocles.

Signing of the basic contract with Creole, Mene Grande, and Shell of Venezuela set the basic pattern (OGJ, Feb. 22, p. 84).

Pressured subtly, both industry and labor came through with an agreement in time for President Romulo Betancourt to announce the agreement right in the middle of his first annual state of the union message to Venezuela.

When it was all over the union had a 10-to-12% wage increase and additional fringe benefits in a package which will cost the Venezuelan oil industry more than $100 million.

The industry, at least the Big Three who went into the bargaining sessions faced with much stiffer demands, said the final pact was good. The government, Venezuela's first democratic regime in almost two decades, had weathered its first big economic threat in the first year of Betancourt's administration.

The government hailed the agreement as a good one in spite of the fact that it will foot almost 50% of the cost through reduced oil revenues.

Even the Communists, who represent about 5% of Venezuela's 42,000 oil industry employees, finally came around. At first the Communist representatives in the Fedepetrol bargaining group refused to sign the new contract.

A few days later they came forward and signed on the dotted line in spite of an undercurrent of dissatisfaction among their followers.

There was some communist muttering that Fedepetrol had "sold out" labor with the 1 million bolivar (about $330,000) contribution by the industry to build a new union headquarters in Caracas.

Other labor leaders carefully avoided a controversy with the Communists to keep the objections from being ballooned into a real issue.

Labor's view . . . Luis Tovar, Ventura Quero, and Juan Quintero Mero, the real Fedepetrol powers, issued a glowing statement to match the one made last week by Labor Minister Luis Hernandes Solis.

The union statement said:

"This is the first time in the history of our country and the labor movement here that a contract of this size has been signed without the intervention of the government, on the basis of free discussions between the unions and the companies."

This was gilding the lily just a bit. Betancourt's administration took no active part in the talks, but with a firm eye on the consequences of a bitter strike in the industry which all but creates the Venezuelan economy, the government made it clear that it wanted a contract settlement as quickly as possible.

It was in marked contrast to labor contracts signed in the past under overt pressure from a dictatorial government.

Signing of the contract assuring 3 more years of stability in the country's big oil industry was met with downright jubilation in some parts of the country.

At Cabimas, which is sometimes called Venezuela's "oil capital" on the eastern shores of Lake Maracaibo, people set off fireworks and rockets to mark the event. Bus drivers drove through the dusty streets of the town with horns blaring.

Company reaction . . . Last week when five more of the smaller producing companies in the country fell into line, there was a little less enthusiasm from the industry.

The contracts signed by Sinclair Venezuelan Oil Co., Venezuelan Atlantic Refining Co., Mobil Oil Co. of Venezuela, Pan Venezuelan Oil Co., and Phillips Petroleum Co. differed in slight respects from the Big Three contract, but not in the essentials.

Most of the smaller companies expressed just about as much satisfaction with the settlement-for-settlement's-sake as did the big companies. But some added a warning that the increased costs involved are certain to have a definite bearing on future operations in the country.

Dr. James A. Tong, president of Mobil of Venezuela company, warned that the new contract would weaken the position of Venezuelan crude in the competitive world market. He said the future, under the increased costs, will be particularly hard on the companies operating in Eastern Venezuela where costs are higher than in the west.

There is a great deal of speculation in Venezuela today that the new labor contract will be just one more factor to hold down operations in the high cost Eastern Venezuela.

In spite of this restrained enthusiasm in some industry quarters, the economy of the country felt an almost immediate upsurge after the contracts were signed.

Retail merchants in areas like Puerto la Cruz, for example, said they could see a sharp increase in business as oil workers, already counting their pay boosts retroactive to October 1, began spending money much more freely than they had in the wait-and-see period of the labor-industry talks.

Leasing in Egypt

. . . may develop as result of successes in Libya.

EGYPT may soon invite companies to bid for acreage in its big Western Desert.

Reports from Cairo are that the United Arab Republic plans to revise the Egyptian oil law to make exploration more attractive in the desert wastes west of the Nile River.

Prospects in the region were considered dim less than 2 years ago when a four-company group gave up rights to 90,000 sq. miles after spending $30 million and drilling nine dry holes. The operating company, Sahara Petroleum, had held a concession covering all of northern Egypt between the Nile and the Libyan border. Participants were Continental Oil, Ohio Oil, Cities Service, and Richfield Oil.

But new discoveries in Libya have placed the Western Desert in a different light. Some of the hottest competition for acreage in Libya has been for rights along the Western Desert border.

Pan American International last year carried out a 2-month reconnaissance in the desert in an area adjoining Libyan acreage in which it was interested. The region was south of the former Sahara Petroleum concession.

Paris Basin Comes Up with Another Good Well

- Stepout in St. Martin de Bossenay flows at rate of 2,200 bbl. daily.

A GOOD, healthy level of production has been obtained from a well in another Paris basin field.

Output from St. Martin de Bossenay 3 jumped from 94 bbl. daily to 2,200 bbl. daily after acid treatment. The optimum level of production has not been determined, but the well is flowing 2,200 bbl. daily, making it the biggest producer at the present in the Paris area.

SMB 3 is the southernmost of seven producers completed on a north-south trend by COPESEP, a company controlled by Royal Dutch-Shell. The discovery well was brought in last year 65 miles southeast of Paris. Production is from a zone at about 4,500 ft.

Several weeks ago, a development well in the Coulommes area, 27 miles east of Paris, came in at 5,000 bbl. daily. The well is located between other, much smaller producers, and its high output was attributed to exceptionally good permeability in the immediate area. (OGJ, Dec. 21, p. 64).

The well, BF 21, was cut back sharply after pressure started to drop. But pressure is building up again.

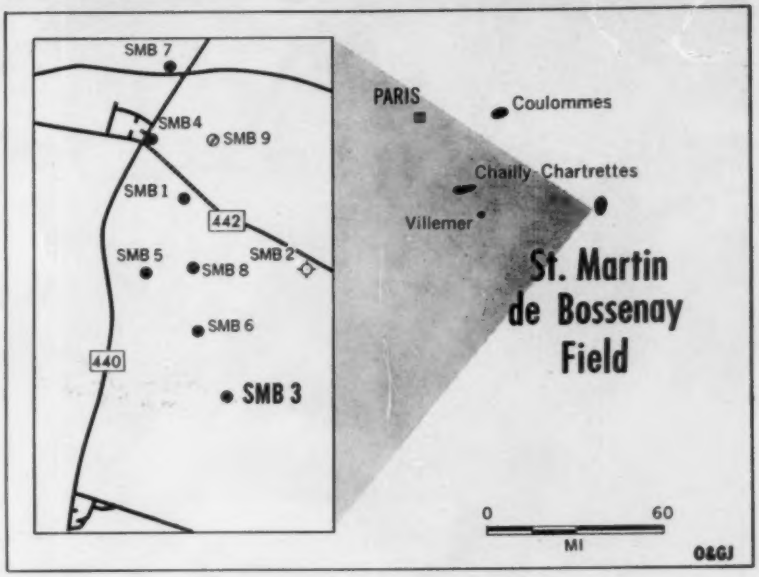
More may be learned about extent of the permeable zone in the latest stepout, which has just started drilling 1,970 ft. northwest of the BF 21. The well is the northernmost location so far in the northeast-southwest trend.

The southwest limits were considered defined after the D 7 came in as a dry hole low on the structure.

Another operator in the Paris basin, RAP, had poor results in its third well on Villemer structure, and its doubtful whether the well will be put on commercial production. The first well, Villemer 101, produces about 315 bbl. daily, and the second well, Vellemer 102, looks good on initial tests. The field is 40 miles southeast of Paris.

The company has completed its Brie 114 in Chailly-Chartrettes field, 16 miles north of Villemer, as a flowing well at 250 bbl. daily, which makes it the best producer on the structure. The well produces from Dogger limestone at 5,630 ft.

The Chailly side of the field lies on another concession, held by CEP.



Cazaux field . . . Four producers have been completed in Esso - Rep's new field in Aquitaine basin. The wells are on a 2½-mile east-west trend on the north shore of Lake Cazaux. The field is about 12 miles north of Parentis.

The Cazaux wells are making from 250 to 320 bbl. daily, either flowing or partially on pump. Output is from two horizons of Albian sandstone topped at about 7,650 ft. and 7,820 ft. The fifth well, Cazaux 4, is starting to drill at a location between 1 and 2. The structure may extend to the east under an airport.

Cazaux was the only new field discovery made by Esso Rep last year. Parentis is now fully developed, with 30 producing and four water injection wells. So are the smaller Mothes field, with four producing wells, and Lugos, with six producing wells.

Big Dredge Deepening Channel in Maracaibo

A GIANT new dredge has started to attack the shipping bottleneck at the entrance to Lake Maracaibo.

The 548-ft. dredge ship is deepening 22 miles of channel to about 47 ft. This will open the way for tankers to 85,000 tons. The present channel can take ships of up to 28,000 tons.

The Venezuelan Government has leased the 273-ton dredge, Zuila, for 3 years from Seadredge Co., Inc., which is operating the vessel under the Liberian flag. Seadredge is an affiliate of National Bulk Carriers, Inc., whose Kure Shipyard Division built the ship in Japan.

National Bulk Carriers is controlled by D. K. Ludwig, an American tanker fleet owner. His company says $30 million would be needed to duplicate the dredge in the U. S. The cost in Japan probably was about half that amount.

The Zuila has four drag heads, which work like vacuum cleaners, with two operating through the ships bottom, and two over the sides. The heads suck up 6,000 cu. yd. of sand and water per hour.

Slurry is discharged through a 437-ft. boom supporting a 57-in. pipe. The boom can be swung in a 180-degree arc across the back of the dredge. It can extend 116 ft. over the stern, where it can discharge mud into waiting barges. Or it can reach out 328 ft. at right angles to the side, in order to throw slurry beyond the edge of the channel.

Each of the vacuum-cleaner heads can cut a 3-mile long 6 ft. wide groove per hour under normal operating conditions. Depth of the cut varies according to the type of bottom.

The dredge can hold 8,500 cu. yd. of mud or silt in its storage compartments. This is a greater capacity than the former record holder, the U. S. Army's Essayons, which can store 8,200 cu. yd. The Essayons has two drag heads, but no boom.

PHOTOS IN THE **NEWS**

Plastic Pavement, And in Color, Yet

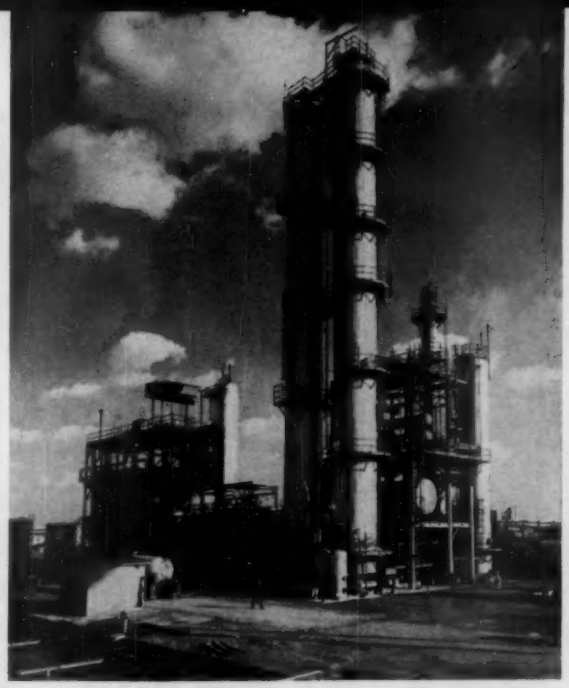
PLASTICS may find their way into highways, airport runways, curbings, and a multitude of other places. Esso Research & Engineering has developed a plastic compound which can be mixed with aggregate to produce durable substances that may replace some uses for asphalt and concrete. And you add color to the plastic compound. Esso has installed brilliant white curbing at its Linden, N. J., lab as part of its tests with the new compound. The company sees many uses for the colored pavement, such as colored runways or highways to indicate the proper lane of traffic.

The Rains Came

THE TEXAS-SIZED rains which soaked much of the Lone Star state recently made it tough going for pipeline contractors. This Panama - Williams' crew slogged through deep mud for several miles while working on an 8-mile spread near Hardin, Tex. The crew was laying a line for Transcontinental Gas Pipe Line Corp.

Biggest of Its Kind

SUN OIL CO. recently put on stream a 120 million pound per year propylene plant at its Marcus Hook, Pa., refinery. The plant produces propylene with a purity of 99.9% from refinery gases. Production goes to Avisun Corp.'s nearby plant. The two distillation towers in the plant have a combined total of 145 fractionating trays. Each is 145 ft. high, 10 ft. in diameter, and weighs about 200 tons. The towers were fabricated by Sun Shipbuilding & Dry Dock Co., which like Avisun is an affiliate of Sun Oil.



More Gas Goes to Market

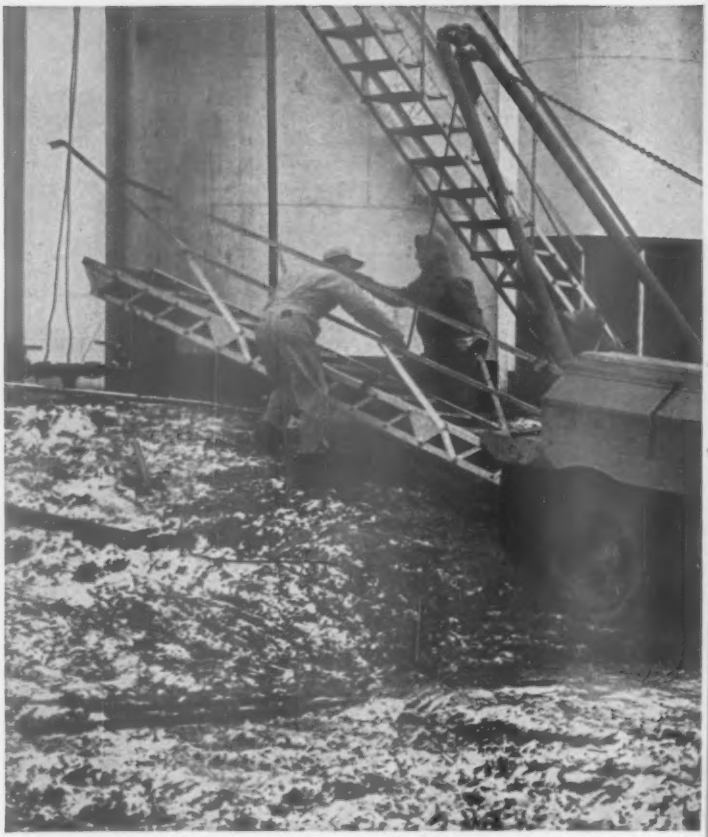
SHELL OIL CO. has started delivering 12,000 M.c.f. of gas daily to Peoples Gulf Coast Natural Gas Pipeline Co., successor to Texas-Illinois Natural Gas Pipeline, from North Rincon field, Starr County, Texas. Casing-head gas pressure is boosted from 50 to 1,000 psi. with a 400-hp. skid-mounted, two-stage compressor.

Pilot Station

SOME CHANGES may be made in Esso Standard's service stations if an experiment at Gramercy, La., pans out. Esso has opened a "Moto-Mat" station near Gramercy on U. S. Highway 61. The station is designed for motorists who don't want to stop at a restaurant. The station features vending machines, an air-conditioned lunch and lounge area, patios for eating outdoors, a staff of maids and hostesses, and facilities for children.

HERE'S ANOTHER REASON WHY
FORD TRUCKS ARE YOUR BEST BUY!

"REGARDLESS OF THE TERRAIN— MUD FIELDS... SAND... SWAMP BEDS—WE DEPEND ON OUR FORDS TO DO THE TOUGHEST JOBS"



SAYS ARNOLD J. LEWIS, MAINTENANCE FOREMAN, FARM BUREAU OIL COMPANY, INC., MT. VERNON, INDIANA

"Our trucks can be found anywhere within a 250-mile radius of Mt. Vernon transporting men and equipment needed for every phase of the oil business. We usually put our 28 Ford Trucks on the toughest jobs because we can depend on them to keep going even if they have to winch themselves out.

"The performance of our Fords is truly outstanding, when you consider that many of our jobs take us along river banks and through plowed fields with mud axle-deep.

"The engines are used just as much for winching and driving other equipment during field operations as they are for highway driving. In two years we get up to 140,000 engine miles on our Fords before we trade them in. During that time we change the oil and oil filter every 2,000 miles and seldom add any oil between changes.

FORD F-600 shown above has a special utility bed designed and built in the Farm Bureau Oil Co. shop. It features a power driven pipe-threading attachment, heavy-duty winch, gin poles, headache rack, rolling tailboard, two-way radio plus both arc and gas welding equipment.

FORD TRUCKS

"In this connection I might add that engine and accessory maintenance is much easier on the newer Fords since they have enlarged the engine compartment.

"Excellent parts availability is another reason why we use Ford Trucks on our toughest jobs ... and we can always get Ford parts at a reasonable price.

"We haven't bought any '60s yet, but it appears that Ford has many new and improved vehicles to choose from and I am sure that we will be purchasing them as we have in the past."

Big Fords for '60 are built for longer life . . . with Certified Durability!

Whatever your job . . . wherever you do it . . . you'll discover just as Mr. Lewis did, that Ford Trucks are the best investment you can make for your transportation dollar.

Certified results of tests conducted by America's leading independent research organization* confirm the fact that Ford Super Duties have been refined for added durability! For example . . .

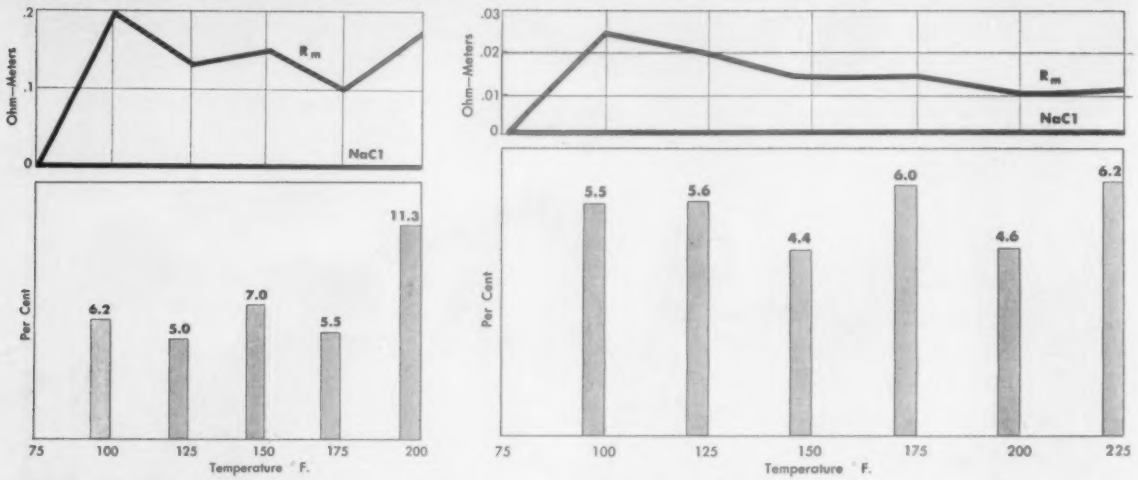
Automatic radiator shutters reduced the coolant temperature variation recorded in severe mountain road tests from a 79° range to a 20° range. Engine operation with coolant temperatures in the 167° to 187° range means less expansion and contraction, more efficient combustion and better lubrication . . . all of which contribute to longer engine life.

Dynamometer tests showed *no vapor lock* with Ford's submerged-type electric fuel pump at temperatures up to 200°. Incipient vapor lock with mechanical fuel pump resulted in a power loss of 9% under the same conditions. Shaker table tests plus constant exposure to oil, water and heat proved 1960 wiring harness to be *three times longer lived.*

Test results plus the experience of satisfied users are important, but that is not all. For 1960, the Super Duty line has been broadened to provide even more flexibility in power train options. See your Ford Dealer!

**Name available on request*

COST LESS *LESS TO OWN . . . LESS TO RUN . . . BUILT TO LAST LONGER, TOO!*



READING RESISTIVITY VALUES for an emulsion mud from a correlation chart for nonemulsion mud can lead to serious error as shown in these figures. Fig. 1 on the left is for a highly resistive mud while Fig. 2 on the right is for a mud with fairly low resistivity. Figs. 1 and 2.

How oil-emulsion muds can

Inaccurate determination of electrical properties of mud, mud filtrate, and mud cake can introduce errors that will give false porosity and saturation answers. Here are some suggestions to follow if your log interpretation is to become more reliable.

BY NORMAN LAMONT
Department of Petroleum Engineering,
University of Texas, Austin

THE INTERPRETATION of electrical logs recorded by resistivity devices depends upon the knowledge of the electrical resistivity of the drilling mud, the mud cake, and the mud filtrate. All electrical logging devices measure, to some extent, such resistivities as a part of the path of current flow. Therefore, it is imperative that these resistivities be determined accurately in order to reduce errors in finding quantitative values of porosity and fluid saturation through log interpretation. In particular, this article illustrates how erroneous values can result when oil-emulsion systems are used as drilling fluids.

Current practice in most areas is to obtain a flow line sample of mud which is circulated from the bottom of the hole just prior to the logging operation. The resistivity is measured and is adjusted to formation temperature by means of a temperature-resistivity correlation such as appears in most logging-company interpretation-chart booklets. Samples of the mud cake and mud filtrate are obtained in the conventional manner and their resistivities measured. These also are adjusted to formation temperature.

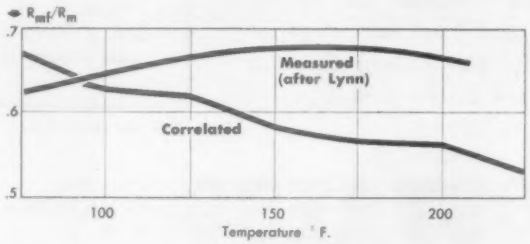
Field practice in the past was to obtain the corrected mud resistivity, as described above, but the mud cake and mud-filtrate resistivities, in lieu of being measured, were obtained from charts correlating these with the mud resistivity. The curves are for average values, and a particular mud may not fall on the given temperature curve. In fact, recently published data indicate that this particularly unhappy circumstance is the rule instead of the exception. Oil-emulsion muds don't correlate with these general curves, but exhibit an entirely different relationship!

Recently published data[2] permit the evaluation of errors introduced by following the above "standard" procedures. Oil - emulsion - mud resistivity values for two samples were measured at temperatures from 75° to 225° F. and compared with values obtained from a temperature-correlation chart.

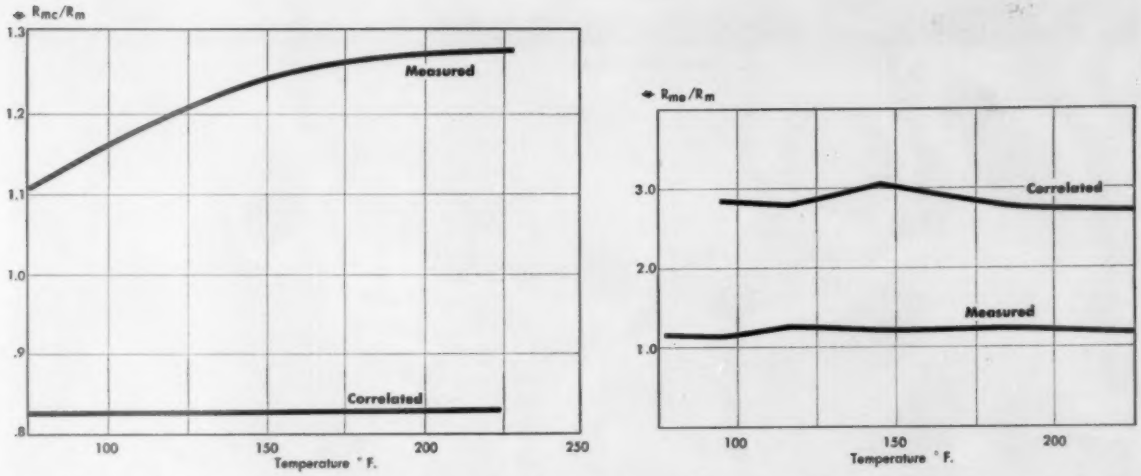
In Figs. 1 and 2, the horizontal line represents resistivity values obtained from the correlation chart at the indicated temperatures, starting with the measured resistivity at 75° F. whereas the actual measured resistivities are indicated by R_m. The bar graphs indicate the per cent variation between the two values.

The practice of correcting oil-emulsion-mud resistivities for temperature can introduce error. How much additional error is introduced by obtaining a mud filtrate or a mud cake resistivity from a correlation chart which is constructed for nonemulsion muds?

To evaluate this, values for R_{mf} were read from such a chart corresponding to the values of R_m which were measured. Values of R_{mf} plotted as the ratio R_{mf}/R_m appear as the jagged curve, Fig. 3. The smooth



CORRELATED resistivity ratios decrease with increasing temperature while the measured values increase to a maximum and then decrease slightly. Fig. 3.



VARIATIONS OCCUR in determining mud-cake resistivity from correlated charts rather than by direct measurement. Figs. 4 and 5.

lead to log-interpretation errors

curve represents the ratios of the measured values of R_{mf} and R_m. At only one point do the two coincide. And, at 200° F. a difference of approximately 15% exists between the two.

Figs. 4 and 5 depict the variation which occurs in determining the mud-cake resistivity from correlation charts rather than by direct measurement.

These errors may appear to be insignificant to many persons but the errors in the resulting quantitative values derived from their use in some evaluation technique may not be. To illustrate this, consider examples in which it is assumed that the mud resistivity is measured at the surface and corrected to formation temperature.

Example 1. Determination of porosity from a microspaced, contact resistivity device in a medium-valued-resistivity, oil-emulsion fluid.

Given:
R_m — 0.494 ohm-m. at 77° F.
Formation temperature — 145° F.
$R_{2''}$ — 2.0 ohm-m.
$R_{1.5''}$ — 1.5 ohm-m.
R OS — 20%.

Item	Data obtained from: Measurement	Correlation charts
R_m (ohm-m.)	0.266	0.27
R_{mc} (ohm-m.)	0.321	0.76
R_{mf} (ohm-m.)	0.231	0.15
R_{xo} (ohm-m.)	6.41	4.64
F_a	27.8	31.0
Porosity (%)	21.0	19.5

Error —7%

Example 2. Same type device in a high-resistivity oil-emulsion mud.

Given:
R_m — 4.17 ohm-m. at 76° F.
Formation temperature —154° F.
$R_{2''}$ — 18 ohm-m.
$R_{1.5''}$ — 14 ohm-m.
R OS — 20%.

Item	Data obtained from: Measurement	Correlation charts
R_m (ohm-m.)	1.99	2.09
R_{mc} (ohm-m.)	2.24	1.77
R_{mf} (ohm-m.)	2.10	1.81
R_{xo} (ohm-m.)	78.5	141.5
F_a	37.4	78.2
Porosity (%)	19.0	13.1

Error —31%

Example 3. Same as 2 but with a contact, focused, shielded, microspaced device.

Item	Data obtained from: Measurement	Correlation charts
R_a/R_{mc}	20.0	25.3
Mud-cake thickness — 0 in.		
R_{xo}/R_{mc}	20.0	25.0
R_{xo}	44.9	44.3
F_a	21.4	24.4
Porosity (%)	15.8	14.8

Error —6.3%

Mud-cake thickness: ⅜ in.		
R_{xo}/R_{mc}	25.0	28.0
R_{xo}	56.0	49.5
F_a	26.6	27.4
Porosity (%)	20.0	22.8

Error: +11.4%

These errors have nothing to do with the mechanical or electrical nature of the tool which is used to obtain the logs. They are entirely the result of incorrect usage of correlation charts in obtaining the basic data which are required for log interpretation. In view of the errors that can be introduced, these precautions should be observed:

1. Resistivity values should be obtained for representative samples of the mud, mud cake, and mud filtrate.
2. These measurements should be made at formation temperature.
3. When it is necessary to use correlation charts the interpreter should realize that he may be introducing errors.
4. Under no circumstance should water-base-mud charts be used for oil-emulsion systems.

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2. Lynn, Ralph D., "Effect on Temperature on Drilling Mud Resistivities." T. P. 1302-G, Society of Petroleum Engineers of AIME.

Acknowledgment

The author thanks R. D. Lynn for permission to use his data.

SWIFT CURRENT in addition to a 40-ft. rise and fall in the water level ruled out conventional dock facilities.

Movable LPG unloading dock saves

BY ROGER STARK AND R. D. CROW
Cities Service Oil Co.

WHEN Cities Service Oil Co. decided to build a barge-supplied LPG distribution terminal on the Mississippi River in Southeast Arkansas, it was faced with a problem: What methods for barge docking and hose handling would be best from both the economical and operational viewpoint?

Location. Previously owned river frontage determined the location of the Lake Village dock facilities. This location was approximately ¾ mile south of the Greenville, Miss., bridge. The Corps of Engineers has installed concrete and stone revetment both upstream and downstream of the river bridge to protect the river bank. This revetment covers the bank at the point available for the dock facilities. The bank at this point has a slope of approximately 1 to 4. The river level varies from 10 ft. to approximately 50 ft. (referred to a datum of 75 ft. above mean sea level) or a 40-ft. rise and fall.

Sparred barge. In preparation for designing the dock facilities, other installations along the Mississippi River were inspected. Most installations were found to be variations of two types. The first is the sparred barge. This type of facility uses an intermediate barge that is held away from the bank by spar poles that fasten to the barge and to the bank. The spar poles can be moved up and down the bank as the river rises or falls.

A trench with piping and takeoff valves is run down the bank of the river. The hoses come off of the sparred barge and connect to the valves in the pipe trench. The derricks and other equipment necessary to handle the hose and product can be installed on the sparred barge. The barge to be unloaded is secured to the sparred barge.

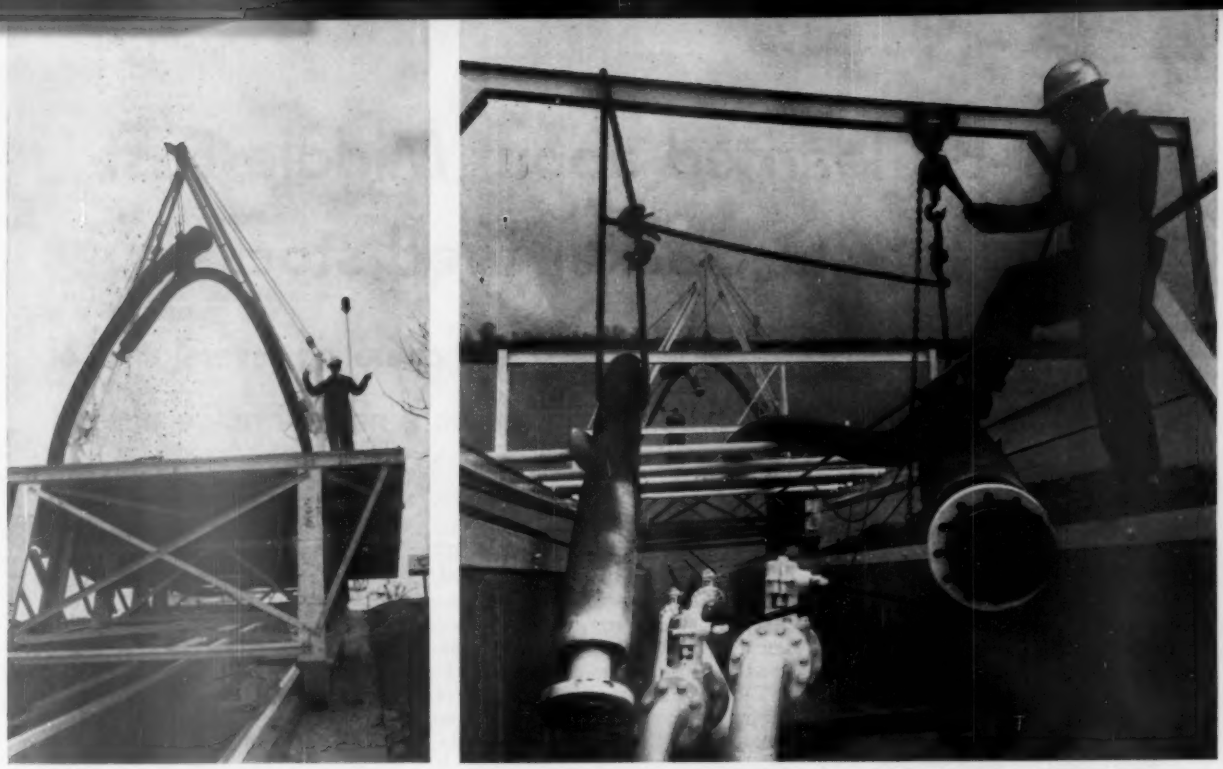
Piling and pipe bridge. The second type of installation involved the placing of pile clusters far enough out into the river so that a barge tying to this piling would have sufficient draft regardless of the river level. The piping necessary to handle the product is taken to the barge across a bridge leading from the high bank to the pile clusters.

The placement of piling in the river with a pipe bridge leading to it was considered first, due to its operational advantage. However, when discussing this with the Corps of Engineers we learned that the relative narrowness of the river at the Greenville bridge caused the velocity of the water to exceed 10 m.p.h. and many of the tows going upstream could not buck the current under the center of the bridge. Much of the traffic, therefore, hugged the Arkansas bank to stay out of the current as much as possible. The Corps of Engineers felt that we would be asking for trouble by placing piling far enough out into the stream to take care of all river conditions. Thus the use of piling was considered not feasible.

The sparred barge was considered next. The operators using sparred barges told us that their main problem is the moving of the spars and hose with the rise or fall of the river. When the river is rising or falling rapidly, it is sometimes necessary to move the spars as often as three times a day. Possibility of using the sparred barge was therefore set aside.

Barge anchorage. To simplify barge anchorage against the swift current it was decided to winch the barges against the bank. A 1-in. bow cable is extended perpendicular to the stream from a 20-ton electrically operated winch located on the high bank.

Two hand-operated winches with ¾-in. cable were placed on the high



MOVABLE DOCK and hose carrier is power-winched up and down a concrete ramp on 36-in. steel wheels. Only difficulty encountered so far has been handling slack in the stiff, heavy unloading hose.

$41,000 over pipe-bridge method

bank to act as a safety in the event the bow cable broke. These also help steady the barge when other tows pass close by. One cable is secured to the center of the barge and the second to the barge stern.

Hose-handling facilities. The design of hose-handling facilities was a major problem. The use of a small hose or derrick barge between the LPG barge and the bank was considered but the idea was scrapped because of a lack of maneuverability and the difficulty in maintaining position and stability in the stream. In conjunction with the derrick barge it had been planned to use a hose carrier to handle hose on the sloping bank. The carrier would have been mounted on wheels to run on top of the walls of the concrete pipe trench. The hose-carrier idea was expanded and ultimately developed into the movable dock that was finally installed.

The movable dock is equipped with 36-in.-diameter steel wheels. The galvanized structural portion of the dock was designed to match the slope of the bank with the 20 by 20-ft. deck being level. The dock is 10 ft. high in the front and in normal operation 4 to 6 ft. of it is above water. Two derricks with 15-ft. booms were mounted on the dock, one to handle the 6-in. liquid hose and the other to handle the 4-in. vapor hose.

A hose carrier 40 ft. long was attached to the rear of the dock and moves with the dock. This carrier facilitates the handling of the hose from the back of the dock to the takeoff connection in the pipe trench. The dock and hose carrier are moved up and down the bank by a 5-hp. winch with a ¾-in. cable.

Concrete ramps 3 ft. wide for the dock to roll on were poured on both sides of the 9-ft-wide concrete trench. Since the runways could not be poured lower than the water level, the 36-in-diameter 12-in.-face wheels were designed to support the dock after it rolled beyond the concrete ramps. However, when the actual construction was under way, the water level fell to its lowest point of 10 ft. allowing the runways to be poured to the water's edge. The ends of steel runways were placed in the concrete and extended 30 ft. into the water.

Operation. Seventy-five feet, or three lengths, of hose have been used for the unloading of all of the barges to date. The day before the expected arrival of a barge, the hoses are connected to the appropriate takeoff valve and the dock is pulled upslope so that it will not be damaged by the barge. When the barge is anchored, the dock winch line is slacked allowing the dock to roll by gravity to the proper position beside the barge. It is stopped where desired so that the hose can be connected. As the barge empties and moves in closer to the bank, the dock is winched back up the slope.

After the barge is empty, the hose can be disconnected from the barge and takeoff valves. The dock, hose carrier and hose can then be pulled upslope and left without worry of rising or falling river level until the arrival of the next barge.

To date one difficulty has been encountered in using the movable dock. Depending on the river level, varying amounts of slack must be taken up in the hose. The handling of slack in the stiff, heavy (30-lb. per foot) hose has been a problem. To solve this, a hoist will be installed 12 ft. above the hose carrier. Slack in the hose will then be handled vertically.

The cost as well as the operation of the dock has proven attractive. Investment in the dock, hose carrier, derricks, concrete and steel runways, and the dock winch and cable totals $9,000. It was estimated that the piling and pipe bridge method or the sparred barge method would have cost in excess of $50,000.

What BP learned about Middle East crudes for cat cracker feed stocks

. . . by operating several units of different design on a narrow range of feed

BY R. J. H. GILBERT AND W. N. N. WRIGHT
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A PILOT reactor and six catalytic-cracking units have been operated by British Petroleum Co., Ltd., for the past several years on Middle East vacuum gas oils in the 660-1,020° F. distillation range. Although this is a narrow range of feed stock, it has provided data on a number of crackers of different design operating on similar feed stocks.

Here's what the study shows:

. . . **Main operating variables** affecting product distribution are feed preheat and reactor temperature.

. . . **Recycle ratio** is significant only if it permits higher conversion.

. . . **Only significant difference** in crudes from Middle East fields is the sulfur and metals content.

. . . **Hydrofining feed stocks** gives better cracked-gasoline quality and boosts through-put of units limited by coke-burning capacity.

Results also show:

1. Under European conditions selection of feed stocks in the 660°-1,020° F. distillation range is more likely to be controlled by middle-distillate requirements than of gasoline output.

2. The problem of increasing the production of diesel-oil components is bound up with consideration of fractionation efficiency in the crude-oil distillation units and the cracking units.

3. Generally speaking it is preferable to extract the maximum amount of straightrun distillate from the stock before feeding to the cracker, since the lighter vacuum distillates only dilute the cracking operation.

4. But, when middle-distillate production is a primary requirement, optimum use of hydrofining capacity may be more important. In this case the high quality of the cracked gasoline is likely to give a marginal advantage to hydrofining cracking feed stocks rather than cracked gas-oil products.

5. Middle East feed stocks processed so far have not been affected by catalyst metal contamination but deep vacuum distillation has not been used. In common with feed stocks from other areas metal content will increase steeply as distillation is continued beyond a vapor temperature of 1,020° F.

Paper presented at fifty-second annual AIChE meeting, San Francisco.

Table 1 shows the characteristics of a range of cracking feed stock from three Middle East crude oils. The materials show striking consistencies in properties and the small range of characterization factors indicates a great uniformity in hydro-carbon type. This consistency is further illustrated in Fig. 1, in which the specific gravity-boiling range relationships for Middle East and a number of other crudes are compared.

Although hydrocarbon components of cracking stock from Middle East crudes have similar characteristics, the sulfur content of stocks of the same boiling range vary appreciably. These variations correspond roughly with variation in crude-oil sulfur content.

Refining operation within the BP group are designed in most cases to meet a product pattern which is markedly different from patterns in the U. S. A typical product pattern for a European refinery can be met by modest catalytic cracking capacity — in this case 5,000 bbl. per day in a refinery having a daily input of 20,000 bbl. of crude. The available straightrun gas oil from the crude is required for inclusion in gas-oil and diesel-oil products. The amount of vacuum gas oil boiling in the range 660°-1,020° F. is enough to provide cracking feed stock.

Commercial Operation

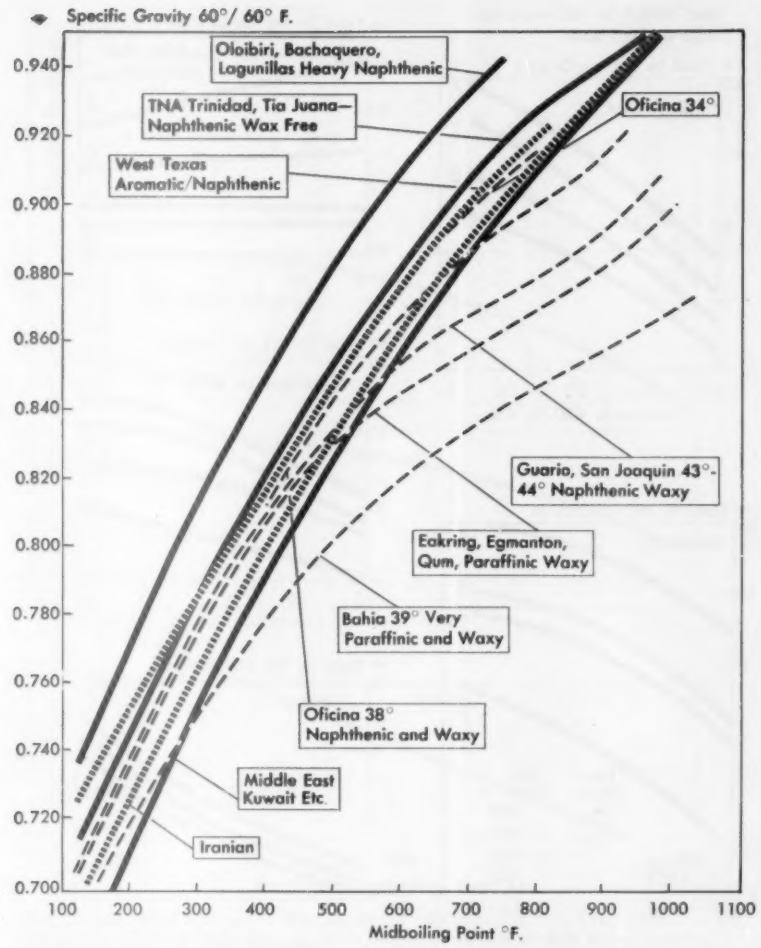
Six fluid catalytic-cracking units are now operating in BP refineries. All use vacuum gas-oil feed stocks similar to those 660°-1,020° F. distillation-range stocks shown in Table 1. The plants are operated with Type A synthetic silica-alumina catalyst.

Table 2 shows a number of differences that exist between unit designs. These differences have a significant effect on the product distribution as shown in Fig. 2.

Conversions over 55% are achieved by recycle operation. Experimental

Table 1—Characteristics of cat cracker feed

	Light gas oil			Heavy gas oil		
	Kuwait (Burgan)	Iraq (3rd pay)	Iran (Agha Jari)	Kuwait (Burgan)	Iraq (3rd pay)	Iran (Agha Jari)
T.b.p. range, °F.	450-650	450-650	450-650	650-700	650-700	650-700
% vol. on crude	16.93	18.43	20.35	4.02	4.26	4.46
Specific gravity at 60° F.	0.8425	0.842	0.848	0.884	0.884	0.8845
°API	36.5	36.6	35.4	28.6	28.6	28.5
Distillation vac. SIL 10.06B:						
20% Recovered at, °F.	.....	.....	.....	.....	.....	.....
50% Recovered at, °F.	.....	.....	.....	.....	.....	.....
80% Recovered at, °F.	.....	.....	.....	.....	.....	.....
Total sulfur, % wt.	1.28	1.04	0.74	1.28	1.92	1.45
Pour point, °F.	0	5	5	50	50	55
Diesel index	58	59	56	47	48	48
Carbon residue (Conradson), % wt.	.....	.....	.....	.....	.....	.....
Vanadium, p.p.m.	.....	.....	.....	.....	.....	.....
Nickel, p.p.m.	.....	.....	.....	.....	.....	.....
Viscosity, kinematic at 100° F.	3.44	3.48	3.59	9.42	9.73	10.58
Viscosity, kinematic at 140° F.	.....	.....	.....	.....	.....	.....
Viscosity, kinematic at 210° F.	.....	.....	.....	.....	.....	.....
Saybolt Universal at 100° F.	.....	.....	.....	.....	.....	.....
Characterization factor	11.95	11.95	11.85	11.80	11.80	11.88



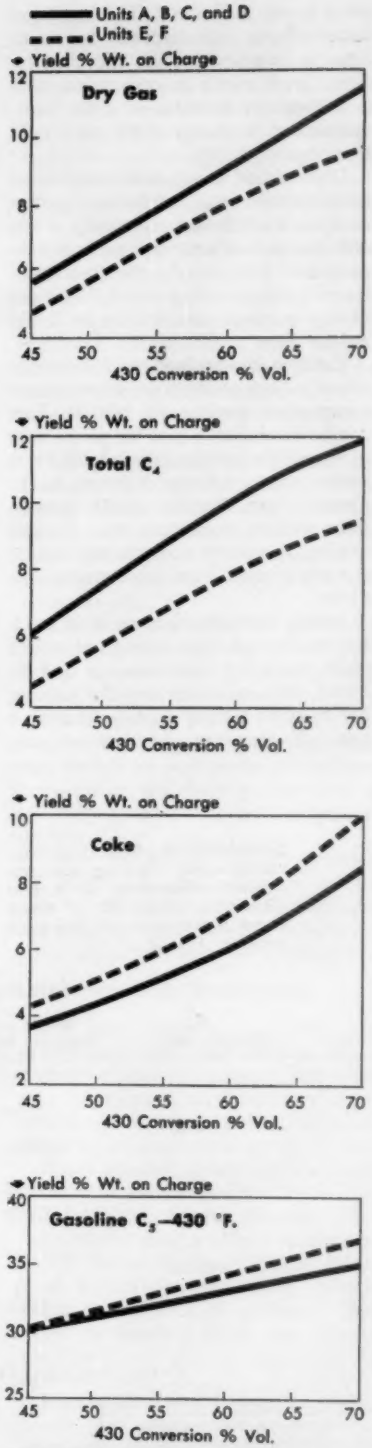
COMPARISON of specific gravity-midboiling point relationship for Middle East and other crudes. Fig. 1.

operation of units at different reactor temperatures confirmed pilot-plant expectations that increased reactor temperatures result in increased gas yields at a given conversion.

The effect of preheat temperature on units C and F is shown in Table 3. In both cases coke-burning rate increased when the feed preheat temperature was reduced. The increase in coke-burning rate was almost exactly equal to the decrease in preheat sup-

stocks derived from selected Middle East crudes

Heavy distillates			Decarbonized oils					
Kuwait (Burgan)	Iraq (3rd pay)	Iran (Agha Jari)	Kuwait (Burgan)	Iraq (3rd pay)	Iran (Agha Jari)	Kuwait (Burgan)	Iraq (3rd pay)	Iran (Agha Jari)
662-1,027	662-1,027	662-1,029	572-1,148	572-1,157	635-1,108	.....	.....	.....
27.6	25.55	26.95	42.3	39.3	32.75	9.45	10.0	7.75
0.9195	0.915	0.912	0.918	0.9125	0.915	0.931	0.9295	0.932
22.4	23.15	23.65	22.65	23.6	23.2	20.5	20.7	20.3
725	724	727	671	660	716	.....	.....	.....
833	820	831	834	804	837	.....	.....	.....
941	932	946	1,004	981	941	.....	.....	.....
2.97	2.65	1.70	2.95	2.60	1.75	2.8	2.4	1.8
85	85	90	85	85	95	130	140	130
40	42	44	40	42	43	.....	.....	.....
0.09	0.10	0.40	0.60	0.50	0.50	.....	.....	1.4
0.04	0.03	.....	0.3	0.25	3.5	.....	.....	.....
0.02	0.015	.....	0.1	0.1	1.0	.....	.....	.....
54.5	50.0	43.5	53.5	42.0	47.5	730	756	830
21.0	19.6	.....	20.5	17.0	18.95	.....	.....	.....
6.8	6.5	6.0	6.7	5.8	6.4	35	35	36.5
48.4	47.5	45.8	48.1	45.2	.....	.....	.....	.....
11.80	11.91	11.88	11.86	11.92	11.90	.....	.....	.....



DIFFERENCE in unit designs has a pronounced effect on the product distribution. Feed stock is similar to those shown in Table 1. Fig. 2.

plied to the feed stock. The increased coke-burning rates appear to result from a combination of two factors. First, an increase in conversion with a consequent increase in coke yield, and second, a change in the coke yield to conversion ratio.

Differences in product distribution to conversion ratio for the two groups of units is attributed principally to the differences in reactor and preheat temperatures. Surprisingly, the absence of transfer-line cracking in unit F did not change product distribution as it did in unit E.

Catalyst contamination. Laboratory investigations of the types of vanadium compounds present in Middle East crudes have shown that the proportion of vanadium present in a volatile form varies widely among different fields. Crudes from Iranian fields contain more volatile vanadium than Kuwait crudes. Vanadium contents of vacuum gas oils derived from these crudes also differ.

Metal contamination of feed stock has so far not been enough to affect plant operation. However, in unit E, metal contamination on the catalyst has reached a fairly high level after 4 years of operation. An increased cat-

SUMMARY of yield-conversion ratios when cracking vacuum-column sidestreams (A, B, and C) and a blend (D) of these three sidestreams in the pilot reactor. Fig. 3.

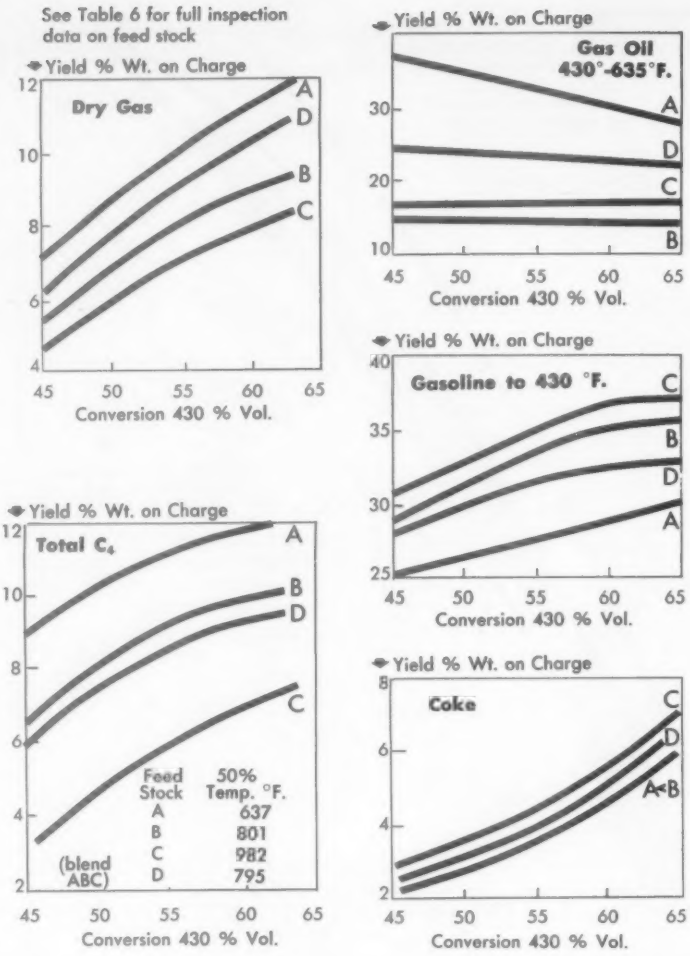
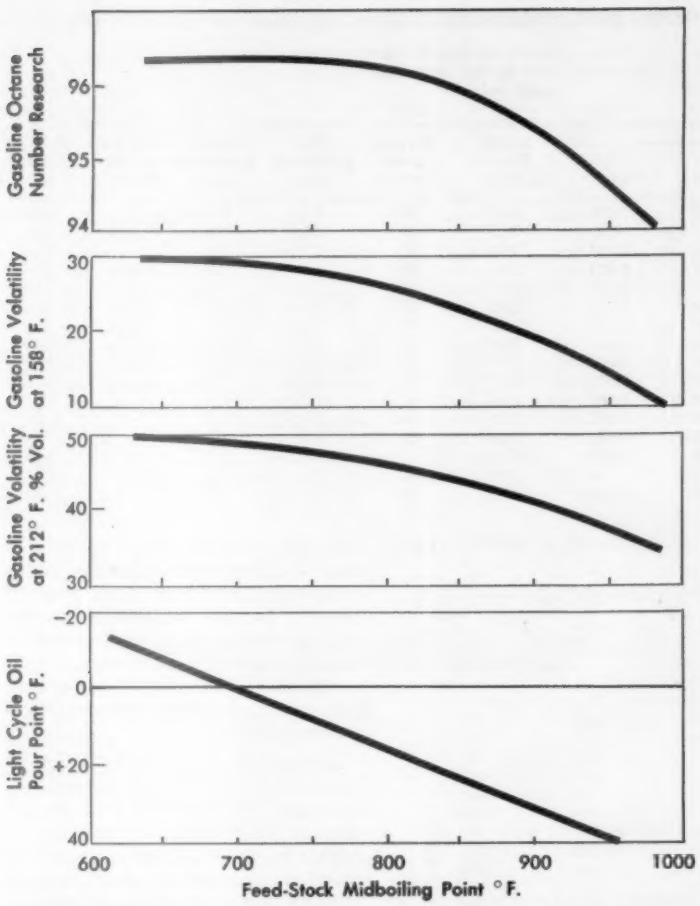


TABLE 2—CATALYTIC CRACKING UNIT DESIGN DETAILS

Unit	°F. Reactor temp.	Single pass capacity BPSD	Feed preheat	Reactor/regenerator arrangement	Reactor type
A	915-940	12,500	Fired preheater	Side by side	Transfer line + reactor
B		12,500	Fired preheater	Side by side	Transfer line + reactor
C		12,500	Fired preheater	Side by side	Transfer line + reactor
D		30,000	Fired preheater	Side by side	Transfer line + reactor
E	880-900	12,500	By exchange with main fractionator products	Reactor over regenerator	
F		12,500	Feed at storage temp.	Regenerator over reactor	No transfer line (Direct feed injection to reactor)

TABLE 3—CATALYTIC CRACKING —EFFECT OF FEED PREHEAT TEMPERATURE

Unit		C		F	
Feed preheat temperature	°F.	650	112	448	243
Reactor temperature	°F.	912	922	885	885
Feed rate	BPD	5,500	5,500	7,000	6,910
Recycle ratio		1.55	1.54	1.38	1.39
Conversion of fresh feed '430'	% vol.	70	77	65.7	67.6
Coke burning rate	lb./hr.	6,540	8,570	8,081	9,006
Product Yields	% wt.				
Gas to C_5		21.2	25.6	17.8	18.5
Gasoline to 430° F.		37.8	36.2	37.5	37.4
Gas oil and residue		32.6	26.2	36.1	34.4
Coke		8.4	12.0	8.6	9.7
Difference in heat available from coke burning	10^6 B.t.u./hr.	22.9		11.6	
Difference in heat supplied to feed	10^6 B.t.u./hr.	23.7		10.2	



PILOT-PLANT RESULTS show the effect of feed-stock midboiling point on product properties. See Column D in Table 6 for inspection data on feed stock. Fig. 4.

alyst-addition rate is now necessary to check a further rise in contamination.

Table 4 shows the accumulation of metals on the catalyst over a 4-year period. The initial catalyst charge had a low level of metal contamination, and catalyst-addition rate averaged 0.09 lb. catalyst per barrel of fresh feed over the 4-year period. Changes in product distribution could not be detected, apart from the steady increase in the ratio of hydrogen to methane in the tail gas. During the first year feed stock was almost entirely from Kuwait crude and contained 0.1 p.p.m. of vanadium. Later feed stocks were derived from Kuwait and Agha Jari crudes with an average vanadium content of 0.4 p.p.m.

In another instance (Table 5) feed-stock vanadium content was increased to 7 p.p.m. because of contamination from a leaking heat exchanger. The loss in catalyst selectivity was great enough to affect the cracking operation. High coke-burning rates and regenerator temperatures were experienced. Contaminating metals were mostly nickel and vanadium. Catalyst iron content remained comparatively low.

Units A and B are identical and are normally operated with about 20% excess regenerator air. High flue-gas $CO_{2/CO}$ ratios in unit A may be associated with catalyst iron contamination in conjunction with a high proportion of excess air.

Modification to catalyst selectivity depends on the quantities of different metals deposited and also on the way in which deposition occurs[2].

Erratic results for iron contamination in these units suggest that scale may contribute part of the contamination, and in this form it may have a relatively small effect on catalyst selectivity.

These results are not quantitative but give a general indication of the rates at which metals accumulate and the stage at which adverse effects on plant operation may be expected.

TABLE 4—MIDDLE EAST CRUDE ACCUMULATION OF METALS ON CRACKING CATALYST UNIT E

Mean catalyst-replacement rate ..... : 0.0067 lb./day/lb. plant catalyst inventory
: 0.09 lb.bbl. fresh feed to plant

Oxygen in flue gas ..... : Less than 1% vol.

Days	Catalyst Metals Content % wt. Fe	Ni	V	Cu	Tail gas wt. ratio H_2/CH_4	Flue gas CO_2/CO ratio
0	0.08	0.001	0.010	0.001	....	2.71
45	0.78	0.006	0.006	0.001	....	...
137	0.88	0.011	0.011	0.001	0.065	...
233	0.98	0.014	0.013	0.003	0.080	2.00
331	1.15	0.007	0.015	0.003	0.064	...
367	0.99	0.010	0.025	0.002	0.050	...
394	1.04	0.012	0.031	0.002	0.080	...
478	1.00	0.011	0.029	0.003	0.080	...
517	1.06	0.014	0.040	0.002	0.140	...
545	0.96	0.016	0.045	0.003	0.120	...
573	0.95	0.014	0.054	0.002	0.130	...
605	1.05	0.016	0.064	0.002	0.170	...
676	1.18	0.016	0.056	0.003	0.180	...
914	1.12	0.025	0.069	0.002	0.180	...
1277	1.12	0.037	0.097	....	0.380	1.90

Pilot-Scale Investigation

The pilot plant was a 2-bbl. per stream day fluid unit with a 4-in.-diameter reactor. Liquid-product yield data were based on laboratory fractionation in a column having the equivalent of 14 theoretical plates.

Good general agreement has been found between the results of pilot and full-scale operations, although coke yields on the pilot scale are consistently 1% below full-scale yields. Pilot-plant results obtained when investigating the effects of different feed stocks on product yields and quality are considered directly applicable to full-scale operation.

Feed-stock origin. Principal vacuum gas-oil feed stocks processed in the pilot reactor were Kuwait, Iranian, Iraqi, and Arabian. No differences in product yields which could be attributed to feed-stock origin were found. Sulfur content of the feed stocks varied between 1.5 and 3.0% by weight and the product sulfur contents varied accordingly. The amount of hydrogen sulfide generated at a fixed conversion was found to be pro-

TABLE 5—FEED-STOCK CONTAMINATION RESULTING FROM LEAKING EXCHANGER UNIT B

Mean catalyst replacement rate ..... : 0.0059 lb./day/lb. plant catalyst inventory
: 0.25 lb./bbl. fresh feed to plant
Oxygen in flue gas ..... : 3-4% vol.

	Characteristics of Catalyst in Plant								Plant operation	
	Metals Content % wt.					Jersey D+L activity	Surface area m^2/g	Gas producing factor	Carbon producing factor	Tail gas wt. ratio H_2/CH_4	Flue gas CO_2/CO rate
0	0.02	0.02	0.004	0.018	0.001						
43	0.32	0.32	0.016	0.044	0.038	26.5	82	1.7	1.7	....	1.46
Days	Fe	Na	Ni	V	Cu	29.0	84	1.5	1.6	....	1.46
127	0.06	0.06	0.020	0.081	0.002	28.5	85	1.7	1.8	....	2.00
155	0.06	0.07	0.024	0.095	0.001	28.0	86	1.6	1.6	0.036	2.06
191	0.02	0.08	0.077	0.155	0.002	25.5	84	2.3	2.1	0.068	2.10
205	0.03	0.02	0.066	0.190	0.001	24.5	87	2.4	2.4	0.064	...
211	0.03	0.01	0.045	0.200	0.001	24.0	85	2.5	2.4	0.109	...
218	0.03	0.03	0.082	0.210	0.001	25.0	88	2.4	2.4	0.129	2.00
239	0.29	0.07	0.068	0.190	0.001	25.0	87	2.2	2.3	0.073	1.92
261	0.35	0.04	0.050	0.110	0.001	25.0	83	2.0	2.0	....	...
281	0.18	0.02	0.070	0.110	0.003	27.0	82	1.7	1.6	....	...
316	0.05	0.02	0.060	0.100	0.002	27.5	84	1.7	1.8	....	...
330	0.06	0.02	0.055	0.089	0.001	28.0	85	1.7	1.7	....	...
428	0.22	0.03	0.056	0.098	0.001	27.5	..	1.8	1.9	....	1.78
460	...	...	....	....	....	28.5	87	1.8	1.6	....	1.96
701	0.29	0.01	0.016	0.091	0.001	28.0	86	1.7	1.4	....	1.47

TABLE 6—CATALYTIC CRACKING—EFFECT OF FEED-STOCK DISTILLATION RANGE

Crude Origin		Iranian (Agha Jari)			
Feed-stock Position on Crude	% vol.	A 50.8 - 63.3	B 63.3 - 75.7	C 75.7 - 88.0	D 50.8 - 88.0
Specific gravity at 60° F.		0.873	0.913	0.944	0.911
Sulfur	% wt.	1.33	1.69	2.13	1.68
Distillation vac SIL 10.06B					
I.b.p.	°F.	185	628	635	536
2% vol. recovered at	°F.	484	664	833	563
5% vol. recovered at	°F.	511	689	858	588
10% vol. recovered at	°F.	545	712	883	619
20% vol. recovered at	°F.	579	741	910	662
30% vol. recovered at	°F.	601	759	936	703
40% vol. recovered at	°F.	617	783	959	750
50% vol. recovered at	°F.	637	801	982	795
60% vol. recovered at	°F.	655	819	1008	838
70% vol. recovered at	°F.	671	838	1036	891
80% vol. recovered at	°F.	698	867	1063	945
90% vol. recovered at	°F.	725	896	1103	1022
95% vol. recovered at	°F.	747	...	...	...
F.b.p.	°F.	788	977	1173	1112
Total distillate	% vol.	99.5	99.0	98.5	97.0
Carbon residue (Conradson)	% wt.	0.04	0.10	2.50	0.65
Diesel index		49	43	36	43

TABLE 7—HYDROFINED CATALYTIC CRACKING FEED-STOCKS

	Iranian (Agha Jari)			
	Atmospheric gas oil		Vacuum gas oil	
Hydrofining Feed-stock— Crude Origin—	Raw stock	Hydrofined product	Raw stock	Hydrofined product
Yield % vol. on raw stock	100.0	97.0	100.0	82.4
Specific gravity at 60° F.	0.833	0.8255	0.9165	0.890
ASTM Distillation				
I.b.p. °F.	414	418	536	669
2% vol. recovered at °F.	...	...	658	682
5% vol. recovered at °F.	...	...	676	696
10% vol. recovered at °F.	472	468	698	711
20% vol. recovered at °F.	491	484	730	736
30% vol. recovered at °F.	504	494	765	759
40% vol. recovered at °F.	511	505	797	788
50% vol. recovered at °F.	520	514	820	811
60% vol. recovered at °F.	529	523	871	842
70% vol. recovered at °F.	538	532	910	869
80% vol. recovered at °F.	550	545	952	907
90% vol. recovered at °F.	567	559	1015	979
F.b.p. °F.	574	599	1098	1067
Total distillate % vol.	92	99.5	96	97.5
Sulfur % wt.	0.84	0.09	1.79	0.11
Carbon residue (Conradson) % wt.	0.04	0.023	0.60	0.07
Hard asphalt % wt.	....	....	0.05	0.05
Wax content % wt.	....	....	12.1	16.4
Melting point of wax °F.	....	....	129	130
Aniline point °F.	163	.....	186	203
Kinematic viscosity at 140° F. cs.	2.6	2.5	19.6	13.86
Kinematic viscosity at 210° F. cs.	....	.....	6.4	5.16
Pour point (upper) °F.	15	15	100	100

portional to the feed-stock sulfur content. The distribution of sulfur in the remaining cracking products was not uniform for the various feed stocks and appears to be specific for individual crudes. Sulfur distribution in catalytic cracking products from Middle East crudes has been discussed in a previous paper[1].

Distillation range. The effect of feed-stock boiling range was examined by cracking three vacuum-column sidestreams which, when blended, gave a typical vacuum gas-oil cracker feed stock. Sidestreams and blend are given in Table 6. Yield-conversion ratios are summarized in Fig. 3, and the effect of feed-stock midboiling point on the product properties is shown in Fig 4. Blends of the three fractions were processed, and, within the limits of experimental error, the results were in line with those calculated from yields of the components and their proportions in the blend.

Some flexibility in operation of the vacuum-distillation units for cracking feed preparation is generally available, particularly the amount of light material which is allowed to remain in the cracking feed stock.

Experimental results show that the highest over-all yields of diesel-oil components are very lightly cracked and little or no wax destruction in the boiling range takes place.

Results also show that when coke-burning capacity is a limiting factor on plant throughput, narrow-boiling-range feed stocks are advantageous. This results from the deep cracking imposed on the heavier components when severities appropriate to the lighter components are used.

Hydrofining. Vacuum gas oils from most Middle East crudes are high in sulfur content, and their quality as cracking feed stocks can be improved

TABLE 8—HYDROFINED CATALYTIC CRACKING FEED-STOCKS

Crude Origin—		Iranian (Agha Jari)			
		Atmospheric gas oil		Vacuum gas oil	
Hydrofining feed stock—		Raw stock	Hydrofined product	Raw stock	Hydrofined product
Yield % vol. on raw stock		100.0	97.0	100.0	82.4
Specific gravity at 60° F.		0.833	0.8255	0.9165	0.890
ASTM Distillation					
I.b.p.	°F.	414	418	536	669
2% vol. recovered at	°F.	.....	.....	658	682
5% vol. recovered at	°F.	.....	.....	676	696
10% vol. recovered at	°F.	472	468	698	711
20% vol. recovered at	°F.	491	484	730	736
30% vol. recovered at	°F.	504	494	765	759
40% vol. recovered at	°F.	511	505	797	788
50% vol. recovered at	°F.	520	514	820	811
60% vol. recovered at	°F.	529	523	871	842
70% vol. recovered at	°F.	538	532	910	869
80% vol. recovered at	°F.	550	545	952	907
90% vol. recovered at	°F.	567	559	1015	979
F.b.p.	°F.	574	599	1098	1067
Total distillate	% vol.	92	99.5	96	97.5
Sulfur	% wt.	0.84	0.09	1.79	0.11
Carbon residue (Conradson)	% wt.	0.04	0.023	0.60	0.07
Hard asphalt	% wt.	.....	.....	0.05	0.05
Wax content	% wt.	.....	.....	12.1	16.4
Melting point of wax	°F.	.....	.....	129	130
Aniline point	°F.	163	.....	186	203
Kinematic viscosity at 140° F.	cs	2.6	2.5	19.6	13.86
Kinematic viscosity at 210° F.	cs	.....	.....	6.4	5.16
Pour point (upper)	°F.	15	15	100	100

TABLE 9—YIELDS OF GASOLINE AND GAS OIL BEFORE AND AFTER HYDROFINING

Feed to cat cracker—		Vacuum gas oil	Hydrofined vacuum gas oil
Over all yields			
Gasoline	% vol.	43.5	38.2
Atmospheric gas oil (430°-635° F.)	% vol.	14.4	24.0

by hydrofining. Hydrofined atmospheric and vacuum gas oils are compared to untreated feed stock in Table 7. Yield results using the pilot reactor on raw and hydrofined vacuum gas-oil feed stocks are shown in Table 8.

The hydrofined feed stock cracked more easily than the raw stock. A conversion of 64% was obtained under conditions which gave 54% conversion with raw feed stock. At the same conversion there is a marked reduction in coke and dry-gas yields, while the butane-butene and gasoline yields are increased.

The yield of cracked gas oil from the hydrofined feed stock is lower than that from the raw stock, but the additional gas oil produced during hydrofining (15% volume on vacuum gas oil) provides an over-all increase in gas-oil production. Yields of gasoline and gas oil based on vacuum gas-oil feed are shown in Table 9.

This increase in gas oil-to-gasoline ratio after hydrofining is of course of great interest in the European market.

Product qualities (Table 10) are greatly improved by feed-stock hydrofining, and the high lead response of low-sulfur gasoline may be an important factor in assessing the economic advantages of the process.

It is interesting to note that, while only 26% of the original sulfur is present in the cracked residue from raw feed stock, 47% of the sulfur originally in the hydrofined stock appears in the cracked residue. This suggests that sulfur compounds which are most resistant to hydrofining are also the most difficult to crack.

TABLE 10—CATALYTIC CRACKING HYDROFINED VACUUM GAS OIL—PRODUCT PROPERTIES

Feedstock type—		Hydrofined vacuum gas oil	Raw stock	
'430' + Conversion		64	64*	54
Debutantized Gasoline to 430° F. TBP				
Specific gravity at 60° F.		0.749	0.747	0.751
Volatility at 158° F.	% vol.	37	36.5	27.5
Volatility at 212° F.	% vol.	57	54.5	51.5
Volatility at 284° F.	% vol.	74	75	72.5
Sulfur	% wt.	0.005	0.140	0.151
Vapor pressure (Reid)	psi.	7.6	7.0	6.7
Bromine number (Francis)		87	91	100
Aromatics (IP 42)	% wt.	34.2	33.7	31.6
Octane number (motor)		80.6	81.5	80.2
Octane number (research)		96	96.5	94.6
Octane number (research) + 1.5 ml. TEL/IG		100.7	99.2	97.2
Gas Oil 430°-635° F. TBP				
Specific gravity at 60° F.		0.9445	0.949	0.9385
Total sulfur	% wt.	0.20	2.6	2.29
Viscosity at 70° F.	cs.	4.41	4.7	.....
Carbon residue (Conradson)	% wt.	0.06	0.05	0.05
Diesel index		5	6	10
Pour point	°F.	−10	−10	−10
Residue above 635° F. TBP				
Specific gravity at 60° F.		0.9115	0.970	0.944
Total sulfur	% wt.	0.20	2.0	1.97
Viscosity at 140° F.	cs.	8.07	10	.....

*Estimated values.

Acknowledgement

The authors express thanks to the chairman and directors of British Petroleum Co., Ltd. for permission to publish this paper.

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1. "Fluid Catalytic Cracking Wax Distillates from Middle East Crudes," J. Inst. Petroleum 38, No. 347,936 (1952).
2. J. J. Rothrock, E. R. Birkhimer, and L. N. Leum, Ind. Eng. Chem. 49, No. 2,272 (1957).

BOOK

HISTORY OF HUMBLE OIL & REFINING CO. By Henrietta M. Larson and Kenneth Wiggins Porter. Published by Harper & Bros., 49 E. Thirty-third Street, New York 16. $7.50. 769 pp.

This is the history of a small Texas company, organized in 1917, which became the largest oil producer in the United States, a leading pipeline carrier, and an important refiner.

This volume traces the efforts by the company's administrators and rank-and-file employes to carry on the business of producing, transporting, and refining crude oil and selling crude and products. From this account emerges a general view of an exceedingly complex organization and of operations in a highly dynamic, competitive, and changing industry.

Humble was one of the leaders in the process of transition of the American oil industry from an empirical to a highly scientific, engineering-oriented industry. This change not only made possible the discovery and production of oil and the building up of large reserves to supply an oil-thirsty civilization; it also made possible a great reduction in costs and in the waste of the natural resource.

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Computer speeds M.c.f.–mile study

This M.c.f.-mile program is in use and is available through Southern Natural Gas. It serves its purpose well. It is not proposed as a blanket-type solution, but could be readily adapted to transmission companies in general.

BY ROY ADAMS

. . . IBM applied science engineer. Adams earned his MS in mathematics from University of Alabama. He has worked for 2 years on various problems having to do with natural-gas engineering and the application of high-speed computers to these problems.

AND F. M. JESSUP

. . . chief, digital-computer section, Southern Natural Gas Co., which firm he joined as planning engineer in 1951. He's a graduate of Georgia Tech.

SOUTHERN Natural Gas Co., has a layout of transmission lines consisting of two multiple-piped main lines about 70 miles apart, paralleling each other approximately 330 miles with each line receiving its supply from different areas. Delivery is effected through an intricate system of branch lines supplied from either main line. In addition to the functional connections at points of supply and delivery, the lines are interconnected at intervals, forming a number of strategic loops that have to be precalculated for balance. All values, such as volume and pressure, are mechanically controlled through regulators at such inter-connections as demanded by operating conditions. The complexity of the problem is increased by the fact that many of the delivery points may be served partially or wholly from either line or area.

The problems facing operating and planning engineers are essentially these: Under actual or proposed operating conditions, from which source, along which lines, and over how many miles is each delivery being serviced? The prime question is: What is the average number of miles for each M.c.f. of gas transported from supply to delivery? This information is used in general in establishing cost of service by rate zones for transmission companies and is essentially for use in Federal Power Commission rates cases.

Advantages of 650 Solution

First this job was adapted to a desk calculator with the solutions for a single operating condition requiring about 40 hours of tedious calculation by a well-trained engineer. As the system, and hence the problem, grew more complex, the job was applied to the IBM 604 calculator.

This approach required about 5 hours of machine calculations by a skillful operator adept at handling punched cars, plus a varying amount of time for review by the engineers. Results proved reliable and time was not too excessive. The most undesirable feature of the 604 attack was the incessant rearrangement and rerunning of the deck of punched cards.

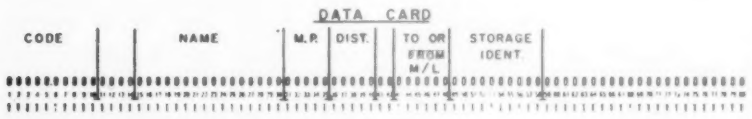
Southern Natural has now programed this M.c.f.-mile project for the IBM 650 digital computer. One complete set of calculations can be compiled within 18 minutes. This program affords, through the 650, a direct, efficient, and accurate approach to this problem. The internal speed of the 650 plays an important role in collapsing time to a minimum but perhaps the most important single facility employed is the internal storage available through the magnetic drum of the computer.

This storage allows for complete consideration of groups of values which are interrelated as opposed to partial treatment and then assembly of partial answers inherent in each of the previous methods outlined. The end result is that calculations are completed by the computer as the data are fed through in one run of a single deck of IBM punched cards.

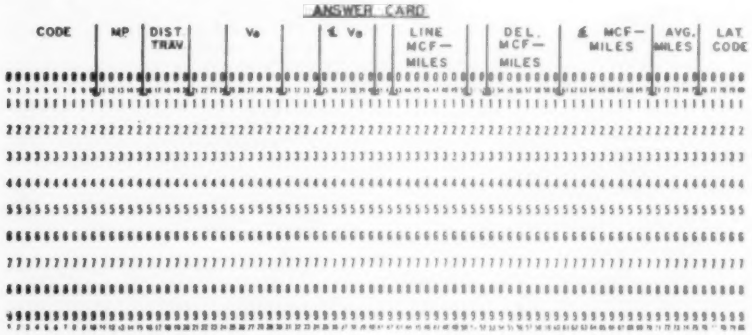
Arithmetic Involved

Generally speaking, the arithmetic is quite simple but voluminous. Decisions necessary for determining relationships of conditions, lines, and deliveries are considerably more complicated and equally voluminous. A given volume flowing along the line acquires M.c.f.-miles through multiplication of that volume times the number of miles traveled.

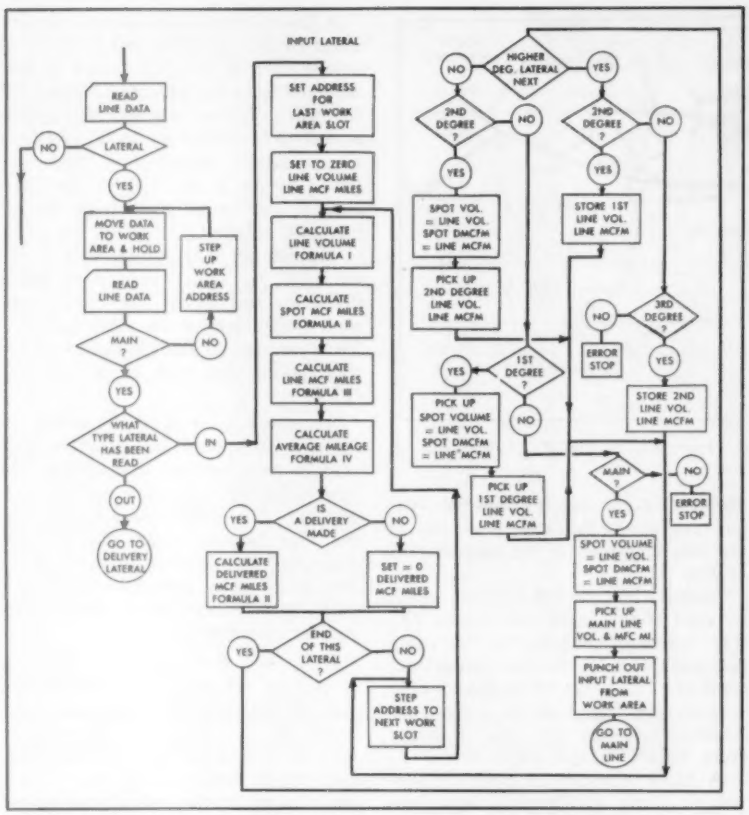
As volume is entered into the line, that volume and its M.c.f.-mile value are added to the accumulated volume and accumulated M.c.f.-miles values. From these, through a process of division, the average miles per unit volume is determined. As a volume is delivered, that volume is multiplied by the average mile value and the resultant product is subtracted from the flowing M.c.f.-mile value while the delivered volume is subtracted from the flowing volume at that point. The following formulas show the basic arithmetic involved in the study.



SAMPLE DATA card for M.c.f.-mile study. Fig. 1.



SAMPLE ANSWER card for M.c.f.-mile study. Fig. 2.



FLOW CHART was first step in programing M.c.f.-mile study. Fig. 3.

Formula I

Line Volume (ΣVo) = ΣVo + spot Vo

Formula II

Del-Spt M.c.f.-mile = Spt Vo × avg. mile

Formula III

Line M.c.f.-mile = ΣVo × geo mile trav.

Formula IV

Avg. Miles = ΣM.c.f.-Mi + ΣVo

Preparation of Problem

In preparation of the problem for the IBM 650, it is necessary to record in punched-card form the basic data for each point to be considered along the pipeline such as supply points, delivery points, junctions of lines, or regulators. This data card will show:

1. An identification code unique for that point, and its milepost position.
2. The popular name of the point on the line.
3. The distance from the point immediately preceding it.
4. The volume of gas entered or delivered at that point.
5. A special coded indicator to label the point as source, delivery, interconnection, junction, or similar designation as needed.

Ths set of data cards is read by the computer to furnish volumes and distances for calculation. Fig. 1 shows a sample data card. After calculations have been completed, this same set of data cards is used with the answer cards, affording for the printout the popular name at each point for which calculations were made. Fig. 2 shows a sample answer card.

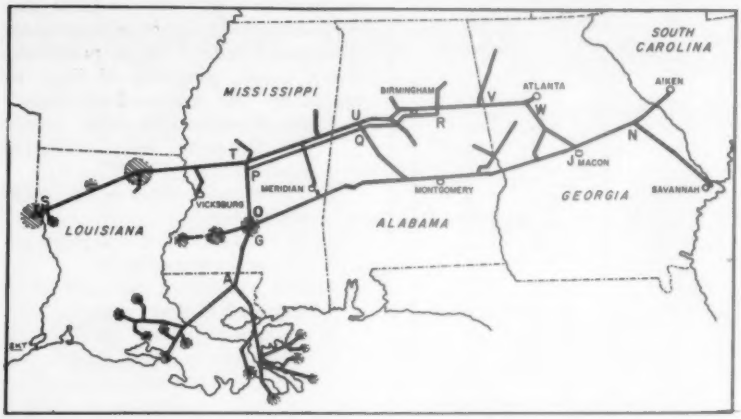
The interconnections among lines, noted above, are synonymous to storage points along the line. The volumes for such storage points are predetermined and are punched in the basic data as delivery volumes. No effort need be expended for reentry since storage is picked up automatically. The program treats the system automatically as it proceeds along the pipeline punching one set of answers for each data point.

The storage drum of the IBM 650 has 2,000 locations, labeled 0000 to 1999. The program employes loca-

CARD NO.	SYMBOLIC INSTRUCTION			MACHINE LANGUAGE INSTRUCTION	COMMENTS
65		RCD	I0001	0066 70 0001 0101	READ NEXT
66		LDD	I0010	0101 69 0010 0113	CARD TEST
67		BD2	LAT1	0113 92 0060 0018	FOR
68		RAL	I0004 LOOP	0018 65 0004 0054	JUNCTION
69	LAT1	STD	W0008	0116 24 0807 0210	MOVE DATA
70		LDD	I0001 STO1	0210 69 0001 0304	TO WORK
71	STO1	STD	W0001	0304 24 0800 0053	AREA FOR
72		RAL	I0002	0053 65 0002 0357	LATERALS
73				0357 35 0005 0069	
74		ALO	I0003 STO2	0069 15 0003 0407	
75	STO2	STL	W0002	0407 20 0801 0354	
76		LDD	I0004 STO3	0354 69 0004 0457	
77	STO3	STD	W0003	0457 24 0802 0305	
78		RCD	I0001	0305 70 0001 0151	READ CARD
79		LDD	I0010	0151 69 0010 0163	ON LATERAL
80		BD1	MAINP	0163 91 0166 0068	
81		RAL	STO1	0068 65 0304 0159	
82		ALO	CON8	0159 15 0000 0355	STEP MOVE
83		STL	STO1	0355 20 0304 0507	ADDRESSES
84		ALO	CON1	0507 15 0150 0405	TO STORE
85		LDD	STO2	0405 69 0407 0260	LATERALS
86		SDA	STO2	0260 22 0407 0310	IN WORK
87		ALO	CON1	0310 15 0150 0455	AREA
88		LDD	STO3	0455 69 0457 0360	
89		SDA	STO3	0360 22 0457 0410	
90		ALO	CON5	0410 15 0050 0017	
91		LDD	LAT1	0017 69 0116 0119	
92		SDA	LAT1	0119 22 0116 0169	
93		LDD	I0010 LAT1	0169 69 0010 0116	
94	MAINP	RAL	LAT1	0166 65 0116 0021	PLACE A
95		ALO	CON8	0021 15 0000 0505	MAIN LINE
96		LDD	TAGM	0505 69 0058 0061	CODE IN
97		SDA	TAGM	0061 22 0058 0111	WORK AREA
98		LDD	I0010	0111 69 0010 0058	TO STOP
99	TAGM	STD	MAIN	0058 24 0000 0103	DELAT LOOP
100	MAIN	LDD	W0008	0103 69 0807 0460	CHECK TYPE
101		BD5	NLAT	DELA 0460 95 0313 0116	LATERAL

CARD NO.	SYMBOLIC INSTRUCTION			MACHINE LANGUAGE INSTRUCTION	COMMENTS
465	ENDIT	RAL	TEST2	0419 65 0104 0670	TEST DEGREE
466		LDD	DEGT	0670 69 0720 0476	OF NEXT LATERAL
467		SDA	DEGT DEGT	0476 22 0720 0723	
468		RAL	CON1	0723 65 0150 0720	
469	DEGT	LDD		0720 69 0000 0770	
470		BD1	SHIF1 MAYB	0770 91 0773 0575	
471	MAYB1	BD2	SHIF2 MAYB	0575 92 0128 0280	
472	MAYB2	BD3	SHIF3 MAYB	0280 93 0483 0285	
473	MAYB3	BD4	SHIF4 SEAC	0285 94 0038 0040	
474	SHIF1	SRT	0003 MAYB	0773 30 0003 0575	
475	SHIF2	SRT	0003 MAYB	0128 30 0003 0280	
476	SHIF3	SRT	0003 MAYB	0483 30 0003 0285	
477	SHIF4	SRT	0003 SEAC	0038 30 0003 0040	
478	SEAC	NZE	ISHI ISLO	0040 45 0094 0195	
479	ISHI	BD3	ISSEC	0094 93 0047 0299	HIGHER DEGREE
480		BD4	ISTRD	0299 94 0102 0571	LATERALS
481		HLT	5555 ISSE	0571 01 5555 0047	
482	ISSEC	LDD	SIGV0	0047 69 0013 0621	SECOND DEGREE
483		STD	KP1ST	0621 24 0122 0625	LATERAL STARTING
484		LDD	SIGMC	0625 69 0045 0349	
485		STD	KP1S	0349 24 0201 0671	
486		LDD	DMCFM	0671 69 0052 0721	
487		STD	KP1D NLAT	0721 24 0172 0146	
488	ISTRD	LDD	SIGV0	0102 69 0013 0771	THIRD DEGREE
489		STD	KP2ND	0771 24 0222 0675	LATERAL STARTING
490		LDD	SIGMC	0675 69 0045 0399	
491		STD	KP2S	0399 24 0251 0322	
492		LDD	DMCFM	0322 69 0052 0372	
493		STD	KP2D NLAT	0372 24 0272 0146	
494	ISLO	BD3	3T02	0195 91 0725 0700	LATERALS OF LOWE
495		BD2	2T01	0700 92 0422 0472	DEGREE
496		BD1	1TOM	0472 93 0449 0327	
497		HLT	6666 3T01	0327 01 6666 0331	
498	3T02	RAL	NVOL1	0449 65 0409 0351	THIRD DEGREE TO
499				0351 16 0000 0522	SECOND DEGREE
500		LDD	REV2	0522 69 0775 0178	JUNCTION
501		SDA	REV2	0178 22 0775 0228	
				0228	0775

WRITTEN PROGRAM in Fig. 3 is shown in symbolic form and in machine language for the same section. Fig. 4.



SNG MAP shows layout of system with flow from AGJN, OPQR, STUVW. Fig. 5.

tions 0000-0799 of this storage. Locations 0800-1999 are reserved for data, allowing each closely related set of points, such as those making up a lateral system, to contain up to 150 points. Eight words are necessary to store basic data and answers for each point.

Provisions have been made for the storage of eight delivery points and the calculations of laterals up to the third degree. More storage areas and higher-degree laterals may be accomplished at the expense of the number of points allowed on a lateral system.

Programing Study

A flow chart is shown as Fig. 3. This chart was the initial step in programing the M.c.f.-mile study. This portion of the program was used to accumulate the volume and calculate an input lateral. Fig. 4 shows the written program in symbolic form and in machine language for the same section as Fig. 3.

Southern Natural has a system which requires about 1,000 data cards. The total 800-word program for this study required about 187 hours of programer time and 100 hours of engineer's time to complete. Fig. 5 shows a layout of Southern's system with flow generally from AGJN, OPQR, STUVW.

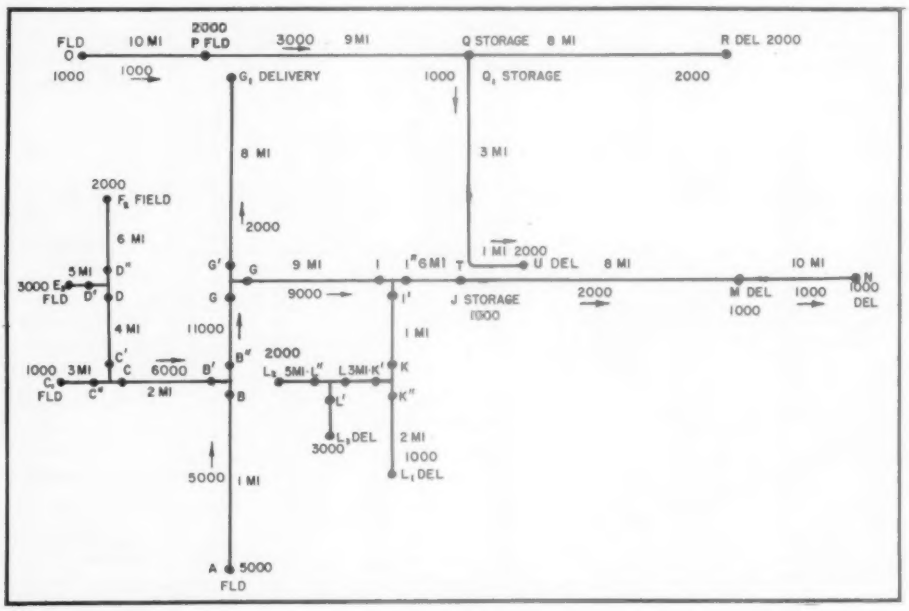
A block diagram of a simple system is shown as Fig. 6. Calculations involved in this study are shown as Fig. 7. Lines AGJN and OPQR and Q_1TU are treated as separate main lines inasmuch as storage inputs cannot be accomplished on a branch line. A first-degree lateral is exemplified by lines $B'C_1$; second-degree by line $C'F_2$; third degree by line $D'E_3$.

A lateral-line introduction is recognized by X's in CC-4 and 7 for first degree laterals or CC 7 and 9 for second-degree laterals or CC-9 and 10 for third degree laterals. An input lateral is identified by an X in CC-1 of the lateral introduction card followed by an X in CC-1 of the first card of the lateral. A delivery lateral has an X only in CC-1 of the first card of the lateral. Any system of laterals ($B'C_1$, $C'F_2$, $D'E_3$) may have both deliveries and inputs but the system as a whole has to be predesignated. Each junction of lines is described by three points such as B, B′, B″, and G, G′, G″.

Assuming point A as the origin of the over-all system, the program will read in data card A, storing the volume picked up from that gas field and punching out answer card A showing the identification code, the volume picked up and the mileage if any with zero M.c.f.-miles, zero delivery M.c.f.-miles, zero accumulated M.c.f.-miles and zero average miles.

Data card B is next read bringing in mileage AB with zero volume for point B and indicating the next card B′ will be on a lateral system. Answer card B will show the identification code for B, mileage AB, spot volume accumulated in the lateral system, accumulated volume in main line just previous to point B input, product of this main-line volume times the distance AB and the accumulation of such products to point B. This information will not be punched out, however, until the lateral system has been investigated to determine the volume and M.c.f.-miles to be put into the system.

The program will then read cards B′, C, C′, D, D′, E_3, D″, F^2, C″, C_1, and B″ and store each into memory. Card B^2 indicates by its return to the main line (x in CC-4) that the lateral system has been completely stored. Calculations for the lateral are then made and stored proceeding from C_1 to C″ and followed by the other in reverse order since it is an input lateral. Answer Card B will then be punched out followed by the answer cards B′, C, C′, etc. Answer card B″ will



BLOCK DIAGRAM represents a simple system. Fig. 6.

MCF-MILES
SIMULATED PIPELINE SYSTEM

	CODE NO.	M P	DISTANCE	SPOT VOL. INP OR DEL.	Σ VOLUME	LINE MCF-MILES	DELIVERY OR INPUT MCF-MILES	Σ MCF MILES	AVG. MILES TRAVELED
PWT A INPUT	1000x000000	0.00	0.00	5000	5000	-	-	-	0.00
PWT B TAP	1x001x000x000	1.00	1.00	(6000)*	5000	5000	62000	5000	1.00
PWT B' TAP	1x001001x000	0.00	2.00		6000	12000		62000	10.33
PWT C TAP	1x001002x00x0	2.00	0.00	(5000)	6000	-	47000	50000	8.33
PWT E TAP	1x00100201x0	0.00	4.00		5000	20000	-	47000	9.40
PWT B TAP	1x00100202x0x	4.00	0.00	(3000)	5000	-	15000	27000	5.40
PWT D'TAP	1x001002021x	0.00	5.00		3000	15000	-	15000	5.00
PWT E_2 FIELD INPUT	1001002022x	5.00	0.00	3000	3000	-	-	-	-
PWT L'' TAP	1001[illegible]3x0	4.00	6.00		2000	12000	-	12000	6.00
PWT F FIELD INPUT	10010004x0	10.00	0.00	2000	2000	-	-	-	-
PWT C'' TAP	1001003x000	2.00	3.00		1000	3000	-	3000	3.00
PWT C_1FIELD INPUT	1001004x000	5.00	0.00	1000	1000	-	-	-	-
PWT B'' TAP	1002x000000	1.00	0.00		11000	-	-	67000	6.09
PWT G TAP	1003x000x000	8.00	7.00	(2000)	11000	77000	26180	144000	13.09
PWT G' TAP	1x003001x000	0.00	0.00		2000			26180	13.09
PWT G_1 DELIVERY	1003002x000	8.00	8.00	2000	2000	16000	42180	42180	21.09
PWT G'' TAP	1004x000000	8.00	0.00		9000	-	-	117820	13.09
PWT I TAP	10C5x000x300	17.00	9.00	(6000)	9000	81000	132540	198820	22.09
PWT I' TAP	1x00[illegible]001x000	0.00	0.00		6000			132540	22.09
PWT K TAP	1005002x00x0	1.00	1.00	(5000)	6000	6000	115450	138540	23.09
PWT K' TAP	1x005002001x0	2.00	0.00		5000			115450	23.09
PWT L TAP	100500202x0x	3.00	3.00	(3000)	5000	15000	78270	130450	26.09
PWT L' TAP	1x005002021x	0.00	0.00		3000			78270	26.09
PWT L_3 DELIVERY	1005002022x	4.00	4.00	3000	3000	12000	90270	90270	30.09
PWT L'' TAP	100500203x0	3.00	0.00		2000			52180	26.09
PWT L_2 DELIVERY	10050020[illegible]x0	8.00	5.00	2000	2000	10000	62180	62180	31.09
PWT K'' TAP	1005003x000	1.00	0.00		1000			23090	23.09
PWT L_3 DELIVERY	1005004x000	3.00	2.00	1000	1000	2000	25090	25090	25.09
PWT I'' TAP	1006x000000	17.00	0.00		3000			66280	22.09
PWT J_1 STORAGE	1007x000000	23.00	6.00	1000	3000	18000	28090	84280	28.09
PWT M DELIVERY	1009x000000	31.00	8.00	1000	2000	16000	36090	72190	36.09
PWT N DELIVERY	1001x000000	41.00	10.00	1000	1000	10000	46100	46100	46.10
PWT O INPUT	2000x000000	0.00	0.00	1000	1000	-	-	-	-
PWT P INPUT	2001x000000	10.00	10.00	2000	1000	10000	-	10000	10.00
PWT Q STORAGE	2002x000000	19.00	9.00	1000	3000	27000	12330	37000	12.33
PWT R DELIVERY	2004x000000	27.00	8.00	2000	2000	16000	40670	40670	20.33
PWT Q_1 STORAGE INPUT	3000x000000	0.00	0.00	(1000)	1000	-	12330	-	-
PWT J_1 STORAGE INPUT	3002x000000	3.00	3.00	(1000)	1000	3000	28090	15330	15.33
PWT U DELIVERY	3003x000000	4.00	1.00	2000	2000	2000	45420	45420	27.71

( )*Machine Summation

SOME CALCULATIONS involved in the study are shown here. Fig. 7.

show the results of the main line AB and the lateral system B-B″.

Data card G is next read and the cumulated volume, M.c.f.-miles and average miles are calculated for that point. This card, being a lateral introduction card, cannot be punched out until the volume to be delivered or picked up on the lateral is determined. Card G′ identifies the type of lateral. The program next reads and stores the lateral system into memory until a return to the main line is indicated.

The total volume to be delivered having been cumulated at this point is multiplied by the average miles at card G to develop a delivered M.c.f.-miles at that point. Card G is then punched out followed by card G′ which uses the delivered volume and delivered M.c.f.-miles from card G as flowing volume and accumulated M.c.f.-miles respectively. Each lateral card is then calculated and punched out delivering volume and accumulating M.c.f.-miles as it flows in the lateral the same as main-line calculations. A higher degree delivery lateral is treated the same as a first-degree lateral with the accumulation of volume and punching out of cards as they are calculated.

Card J storage is different from other deliveries inasmuch as the delivered volume and M.c.f.-miles have to be stored and picked up as an input card on line, Q_1TU.

At the end of line AGN and all other main lines there will be zero volume and accumulated M.c.f.-miles after the last delivery. Point O will be shown as an input to a main line with zero volume and accumulated M.c.f.-miles. Card Q will deliver a volume and M.c.f.-miles figure into storage to be picked up by line Q_1TU.

Line Q_1TU will begin with an input from a stored M.c.f.-miles and Volume Q. The average miles of transportation will be calculated at this point which will be the same as Card Q. As the program proceeds along the line, card T will be read as an input volume with accumulated volume and M.c.f.-mile addition. Both of these quantities will be picked up from storage where they were placed in calculating J storage in line AGJN.

The only manual steps remaining in the M.c.f.-mile study are data preparation and storage-point volume determinations. In the future it is felt that these too will be mechanized.

Description of Method

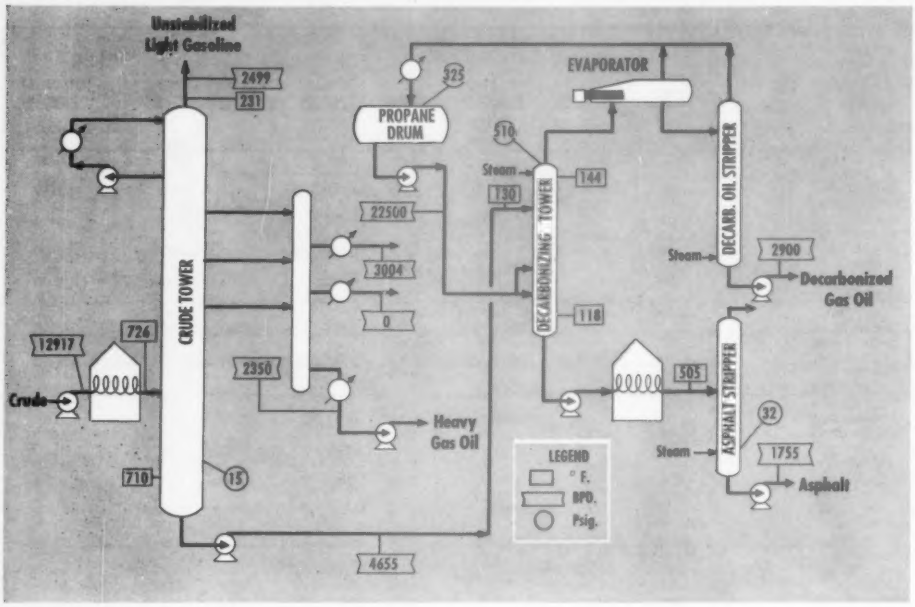
This method of computation is different from some of the approaches following the general idea of the Hardy-Cross method. It is shorter and more direct and is made possible by the fact that volumes on all closed loops are set by regulators and therefore need no balancing. Without such regulating controls, it is felt that the approach outlined would be difficult to program for a medium-scale computer.

Within transmission companies, however, regulated pressures and volumes seem to be prevalent. This is in direct contrast to distribution systems where closed loops without regulators are common. Consequently, the program as it now stands is designed for transmission systems with relatively few closed loops having regulators. For such systems it affords fast computing and simplicity of use and preparation.

Southern has now developed a companion program for the IBM 650 for flow-pattern calculations, using the same logic approach for an identical system of regulated loops. It holds great promise for the calculation of pressure-volume relationships in a minimum of time.

Study is being directed toward having the IBM 650 compile delivery volume directly from sales information which is already on punched cards. Following that step, attention will be focused on computing supply volumes through economic factors and contract requirements.

As the present M.c.f.-mile program is refined to give more available space in the internal storage of the computer, or with the use of magnetic tape input for the computer, it is definitely felt that all line-storage volumes will be computed as a part of the main program. With these modifications in mind, complete automation of both the M.c.f.-mile study and the flow pattern calculations are foreseen.



NEW TYPE catalyst gives ethylene conversions as high as 98.7% in ethylbenzene production. Fig. 1.

New catalyst converts higher percentage of ethylene in making ethylbenzene

BY EDWIN K. JONES
Universal Oil Products Co.

A NEW TYPE solid phosphoric acid catalyst is now in commercial use for the production of ethylbenzene and cumene. This catalyst is designated as UOP No. 4 polymerization catalyst and differs considerably from earlier solid phosphoric acid catlysts. Although the new catalyst is also useful for polymerization, when used for ethylbenzene production, it has higher activity toward the primary alkylation reaction and lower activity toward the undesirable polymerization side reaction.

The alkylation activity of the catalyst gives ethylene conversions as high as 98.7%. The charge to the process is a C_2 and lighter gas stream, containing 29% ethylene obtained from a propane cracking unit, and high-purity benzene.

Polymerization of ethylene when producing ethylbenzene is not appreciable and the quantity of higher-boiling alkylbenzenes produced is negligible.

Equipment and operation. This article describes ethylbenzene facilities designed and licensed by UOP for El Paso Natural Gas Co.'s Odessa, Tex., plant. These facilities consist of a feed absorber, reactor, gas separator, benzene fractionator, and ethylbenzene fractionator.

Ethylene feed stock is produced by steam cracking of propane and high-purity benzene is purchased as the second feed material.

The propane cracking-gas recovery system has been simplified considerably in that refrigeration is not required. A very clean separation is made between propylene and ethylene by absorption and stripping. Table 1 shows a typical C_2 and lighter stream from the gas-recovery unit for feed to the ethylbenzene unit.

The feed absorber takes the total C_2 and lighter gases, absorbs them in benzene, and the resulting liquid is then passed through the feed heaters into the solid phosphoric acid catalyst. From this reactor effluent stream, the C_2 and lighter gases are separated, the benzene fractionator removes the benzene which is recycled back to the reactor, and the ethylbenzene column separates the ethylbenzene from the bottoms. The flow of this unit is shown in the diagram.

After 7 months operation on the original charge of the new catalyst, the unit is still operating at a high ethylene-conversion rate. The ethylene conversion started at 98% and presently is at 90%. This reduction is due partially to increasing the unit production beyond design capacity with only a partial catalyst charge. This drop in conversion will be compensated for in the next run by increasing catalyst loading and additional minor changes.

Table 1
Typical Composition of Ethylene Feedstock to Ethylbenzene Unit

Sp. Gr.	0.625
H_2, Mol %	18.1
C_1	44.0
C_2	7.9
C_2=	29.8
C_3	0.1
C_3=	0.1
	100.0

Table 2
Typical Change and Product Yield from the Ethylbenzene Unit

	Gal./Day
Charge	
Ethylene	17,700
Benzene	19,400
Products	
Ethylbenzene	25,800
Bottoms	2,000

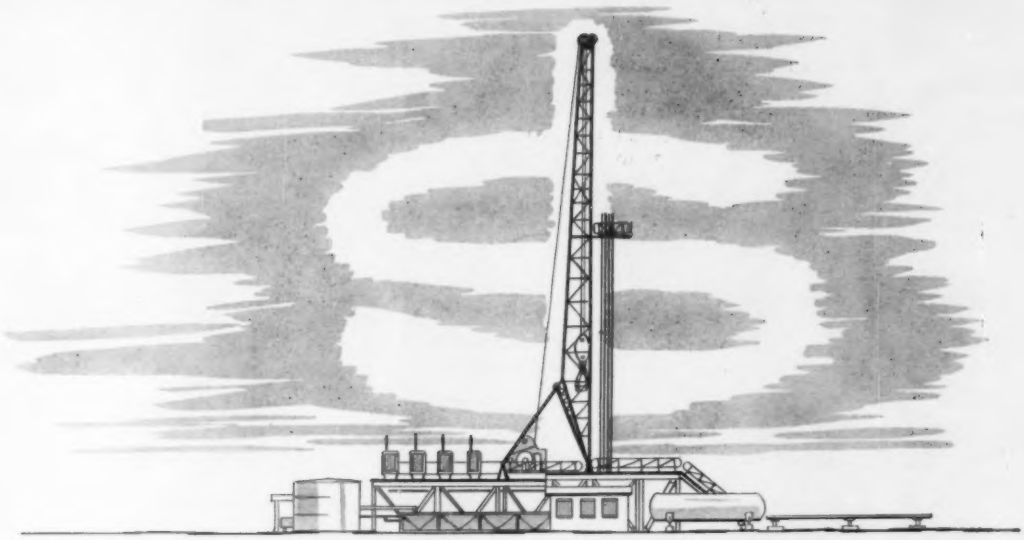
Table 3
Typical Composition of Ethylbenzene Unit Products

	Composition, Wt.-%
Ethylbenzene	
Ethylbenzene	99.9
Other Aromatics	0.1
	100.0
Bottoms	
Ethylbenzene	2.6
Diethylbenzene	67.8
Cumene	9.1
Triethylbenzene	2.7
Butylbenzene	17.8
	100.0

Yields and Product Quality

Table 2 shows the charge and yields from a typical operation on the ethylbenzene unit. The ethylbenzene normally has a 99.9+% purity.

Table 3 gives the composition of the ethylbenzene and bottoms products. This ethylbenzene when dehydrogenated and fractionated results in a styrene having a purity of between 99.75 and 99.9%.



Check these factors which affect hole costs—they are basic

BY PRESTON L. MOORE
Petroleum Engineering Department
University of Oklahoma

IT WAS SHOWN in Part 1 of this series (OGJ, Feb. 8, 1960) that a reduction from $84,000 to $60,000 in initial well cost increased the average annual rate of return for a particular well from 5 to 20%. This shows that future expansion for some oil companies may depend on their ability to reduce well costs. Although there are no methods that include a guarantee of results, costs have been reduced in many localities by closer supervision, better engineering, and a full knowledge of the factors which actually affect well costs.

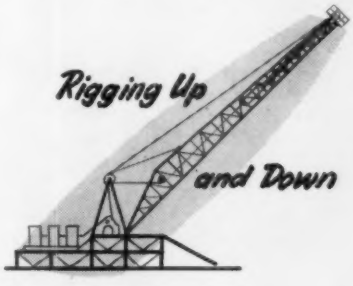
The following discussion includes brief resumes of these factors. Later parts will include details on how each affects cost and methods of application that have cut well costs.

Supervision. The need for close supervision cannot be overemphasized. A $100,000 oil or gas well receives relatively little attention when compared with the same size investment in other industries. Test results from the application of a new development may be discounted as inconclusive unless the improvement in performance exceeds 10%. This attitude is based on the feeling that the first 10% improvement comes as a result of additional supervision.

As a result unless the improvement exceeds 10%, the new development is discarded and strangely enough so is the additional supervision. Any program established to reduce costs in a given area generally succeeds, partially because of the increased interest that promotes better supervision.

Engineering. There is definitely a need for more engineering in the drilling of oil and gas wells. The operation has reached the point that operators are not interested in small improvements. Reasons for this are obvious—total well time and costs receive attention, not the component parts that contribute to these totals. If an improvement reduces the cost of one function, but total cost remains the same, many operators will not accept the improvement.

Uutimately this feeling must be discarded by better engineering. The answer may lie in better communication between operating and staff personnel. There is no doubt that more concern must be assumed for the parts that contribute to total cost if improvements are to be made. For example, bit selection should not be based on what happens to be available at the time. Bit weight and rotary speeds should not be changed as regularly as tour changes on the rig.



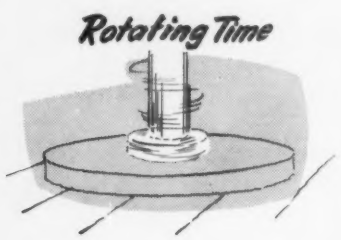
Fluid hydraulics programs should be designed to use the fluid power available in the most efficient manner, not limited because one person believes that an increase in surface pressure will increase costs. Fluid properties should be based on need, developed from investigation and planning, not changed with each new derrick man. If a 1% improvement is made, retain this and add new improvements; do not discard it as being insignificant.

Drilling research is receiving more emphasis now than ever before; field engineers and companies should take

advantage of this trend and be ready for improvements. A field test isn't fairly evaluated unless it is conducted in an environment generated by a well-planned and closely supervised operation. Real improvements will come in drilling only when science becomes an equal partner with the practiced art.

Well-Cost Factors

To provide a basis for future emphasis in cost reduction, the following



is a summary of the major factors in well costs. These may be separated into those functions that are either dependent on or contribute to total well time and those that are essentially independent of time. Included in this first category are the following:

1. Rigging up and down.
2. Rotating.
3. Round trips.
4. Drilling-fluid costs and mud-conditioning time.
5. Formation evaluation.
6. Waiting-on-cement time.
7. Hole trouble.

In the second category would be items such as steel tonnage for casing plus other permanent well equipment and well materials such as cement.

Rigging-up-and-down time. The time required for rigging up and down has been sharply reduced in recent years. This has been done by unitizing existing equipment and demanding more portability for new equipment. Portable rigs have made it possible to rig up and down in a few hours in localities where several days may have been required a few years ago.

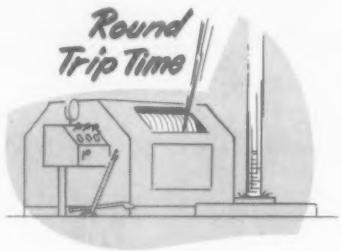
Rotating time. Rotating time will vary between 40 and 70% of total well time. Many operators stress the necessity of keeping the bit rotating. While it is true, that hole is made only when bit is on the bottom, it is of equal or more importance to apply methods of increasing penetration rate when rotating.

Many techniques may be applied to increase the rate of penetration and in some way almost all of these are related. For example, increasing the weight on the bit or increasing rotary speed will increase drilling rate only if there is enough cleaning below the bit. This cleaning below the bit is dependent on the fluid power that can be developed at the bit, which introduces a need for a properly designed hydraulics program.

Even after maximizing power at the bit, removal of cuttings from below bit and transportation of these cuttings to the surface is dependent on the flow properties of the fluid. As a result, applying only one technique to increase penetration rate may result in failure unless all of the others are considered.

Factors affecting the rate of penetration and methods for reducing the cost per foot of hole will be discussed in detail in future articles.

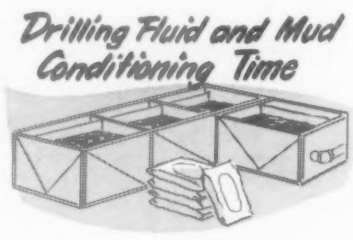
Round-trip time. Time required for round trips has increased as well depths have increased and drill-collar strings have become longer. To combat this, the hoisting horsepower has been increased, and better and faster methods of handling drill collars have been used. However, the speed by which drill collars are handled varies considerably in various sections of the country. Training programs for crews,

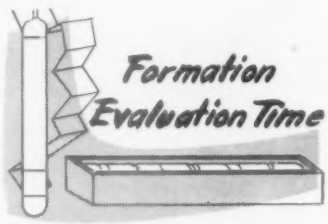


where the procedure for handling collars is slow, return attractive profits for the time spent.

The running and pulling speed for pipe may be increased; however, caution should be used in this respect. Many hole troubles come as a direct or indirect result of the rate at which drill pipe is pulled from or run into the hole.

Drilling fluids and mud-conditioning time . . . A cost often overlooked by operators is that spent on drilling fluids and the required mud-conditioning time. Supervision of the mud is entrusted to almost any member of a rig crew that confesses to an understanding of drilling mud. Primarily this responsibility belongs to the derrick man, who may or may not have a knowledge of drilling-fluid composition. In addition a representative of the mud-supply company, who generally has a good working knowledge of mud treatment, comes by two or three times a week and makes suggestions.



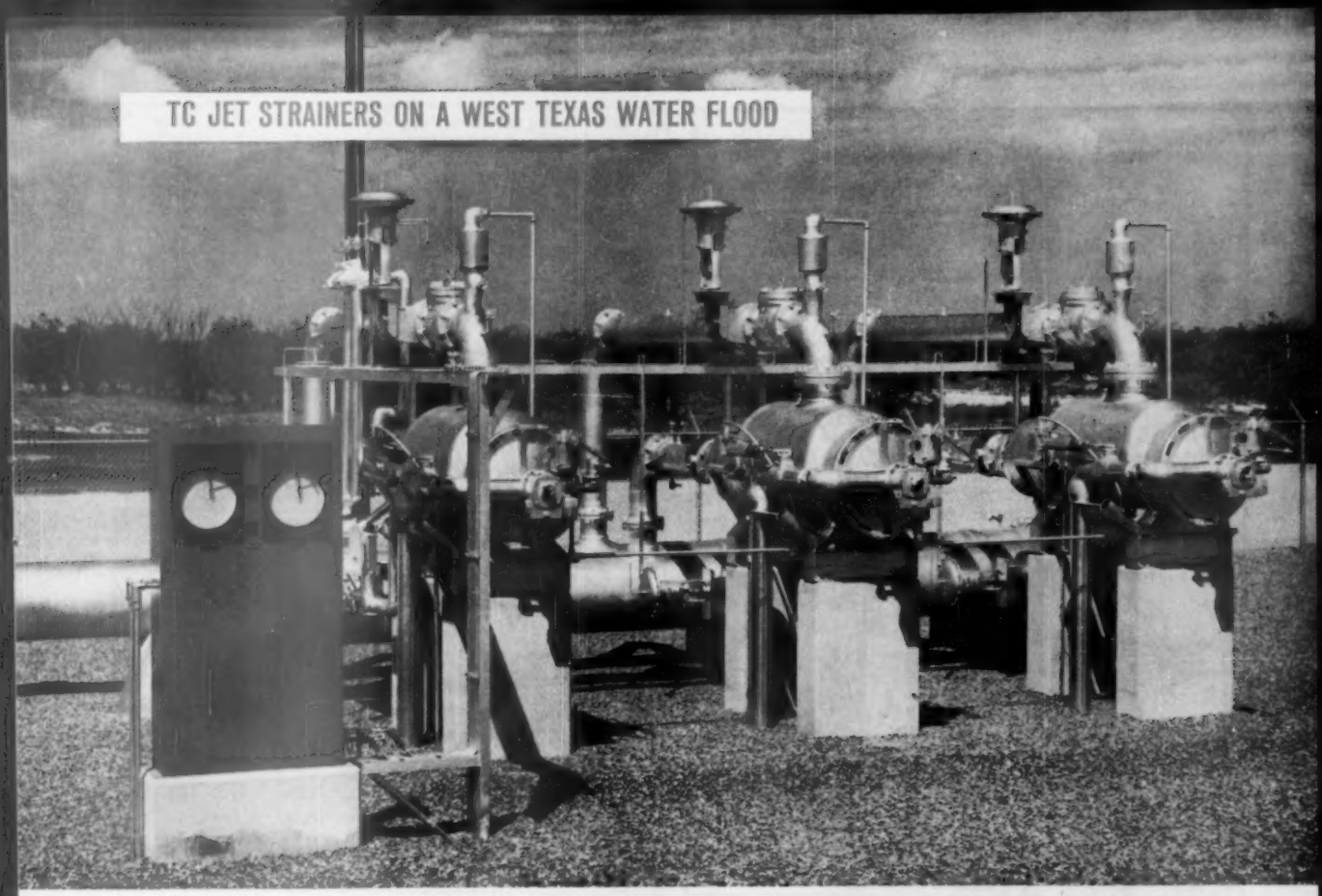


Unfortunately, this man has many responsibilities and cannot always be thoroughly familiar with the specific drilling-fluid requirements. Therefore mud treatment becomes a trial-and-error solution, where more times than not, an operator is ultimately "treating the treatment." Evidence of the apparent unconcern is the discussion of mud costs in a given area. In a location where the cost of mud averages $10,000 per well, there will be little concern expressed over a difference between mud cost of $8,000 and $12,000. The question becomes, why can't a majority of the costs be $8,000? With close supervision this would be easily possible.

Some of the mud-treating practices may proceed in this fashion: The mud is flocculated and water loss is high. Driscose is known to be a water-loss control agent and five sacks are added at a cost of $225. Result: improvement slight. Why? Additional flocculation tending to further increase water loss. What should have been done? Water was needed; a thinning of the mud would have reduced the water loss. This may be an exaggerated case; however, it happens many times. Mud conditioning, another time-consuming factor in many areas, may be reduced by the pretreatment of muds before drilling cement or known areas of contamination.

Drilling-fluid costs will exceed 10% of the well costs in some areas. This is the direct cost. Success or failure in reaching the desired objective may also depend on the drilling fluid. Because of this, future articles will be devoted to drilling fluid and methods of minimizing cost.

Formation-evaluation time. An appreciable source of cost is the time required for evaluating formations pene-



The One Sure Way to Clean Up Injection Flood Water

There's a big difference in water filtration equipment. Here, for example, are three small, compact, T-C Self-Cleaning Jet Strainers with a huge capacity for handling injection flood water. But best of all, these strainers require little attention, even less maintenance expense. In fact, their operation is fully automatic. They clean themselves when the baskets become dirty. At a predetermined pressure-differential across the basket, rotating jets go into action and scour the baskets clean. The entire cleaning operation takes only a few minutes.

T-C Jet Strainers are available in 10H, 20H and 30H sizes. 100, 200, and 400 mesh screens are interchangeable, depending on the particle size of sand and solids to be removed from the water. Extremely fine filtration, down to sub-micron particle size—including algae and bacteria—can be obtained easily with the aid of a diatomaceous earth coating on the basket.

If you attach importance to the cleanliness of your flood water—and most operators do—you should know all about T-C Jet Strainers. A brochure will gladly be sent on request.

An over-all view of a water filtration installation near Odessa, Texas. The three Model 30-H, T-C Self-Cleaning Jet Strainers are shown in the close-up above and at far right in this picture.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

We'll save $1,600.00 on this workover by using

OTIS TUBING SERVICE

...here's how!

We've got a 6,000-foot dual-producer here that is either leaking around the packer or has a hole in the tubing. At least something went wrong because we had a sudden pressure drop on the lower zone and an increase in pressure on the upper zone. In either event, we're going to have to pull the tubing. And, since we rely on Otis for help on almost all our downwell problems — such as completion techniques and equipment, sub-surface flow control, etc.— we naturally called them in on this job.

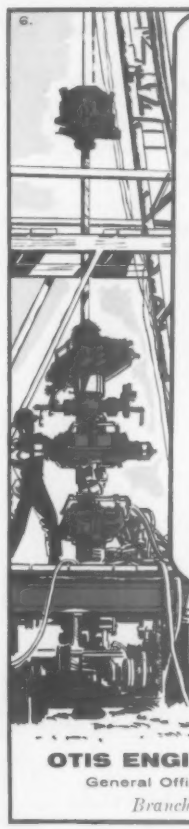
Otis' charges to round-trip the tubing under pressure — this means without killing the well with mud — will figure about $2,800.00, excluding rig costs.

6...12 hour days
or 72 hours as follows:
The first 40 hours...$1600.00
32 hours at 30.00 an hour..960.00
Mileage charges are
80 miles at 75¢ per mile...60.00
Wire line work to plug
tubing and remove plug...170.00
$2,790.00

By way of comparison, our district production superintendent's office estimates it would cost around $4,400.00 to kill the well with mud — exclusive of rig costs. These figures are based upon completing the job without running into trouble, of course.

Oil base mud.....$2200.00
Pump truck to kill well..580.00
Steel mud pits.....100.00
Reserve pits.....100.00
Swabbing.....200.00
Extra mixing and pump
time to handle
oil base mud.....1200.00
$4,380.00

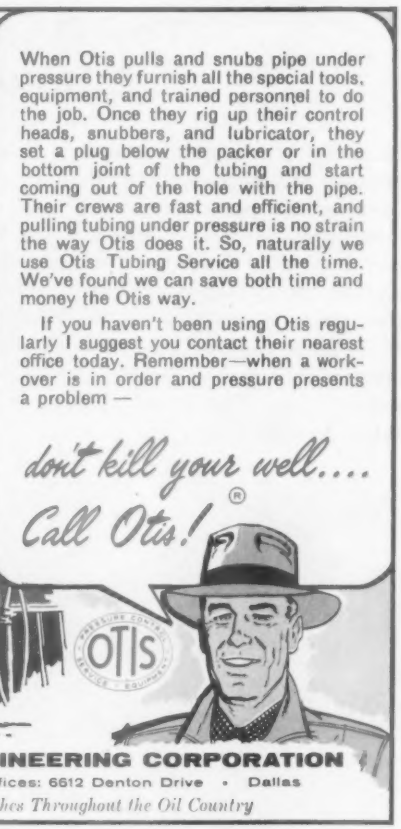
Besides the initial savings we'll make by using Otis Tubing Service, we're eliminating the possibility of fouling up the producing formations with mud. On a few occasions, we killed a well because we thought it would reduce our workover expenses — but by the time we got through cleaning up the formations to bring production back, our costs had skyrocketed. One or two times the well never did come back to full productivity. These proved to be some of the most expensive workover jobs we ever did. We learned the hard way.



When Otis pulls and snubs pipe under pressure they furnish all the special tools, equipment, and trained personnel to do the job. Once they rig up their control heads, snubbers, and lubricator, they set a plug below the packer or in the bottom joint of the tubing and start coming out of the hole with the pipe. Their crews are fast and efficient, and pulling tubing under pressure is no strain the way Otis does it. So, naturally we use Otis Tubing Service all the time. We've found we can save both time and money the Otis way.

If you haven't been using Otis regularly I suggest you contact their nearest office today. Remember—when a workover is in order and pressure presents a problem —

don't kill your well....
Call Otis!®



OTIS ENGINEERING CORPORATION

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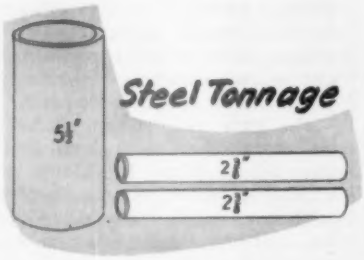
trated. This is particularly true for wildcat wells. Methods used for this purpose include coring, logging, drill-stem tests, and production tests. A review of wildcat wells drilled in many areas reveals that much of the well cost may be related to formation evaluation.

There is no argument with the fact that wildcat wells are drilled to find commercial zones of hydrocarbons. However, the argument that includes a story on a prospect that was bypassed serves as no basis for useless evaluation time on the future well. This is the same as assuming that if one well costs $1,000,000, all wells in the same field will cost $1,000,000. Pay zones will be bypassed regardless of the evaluation methods used and the application of new methods of

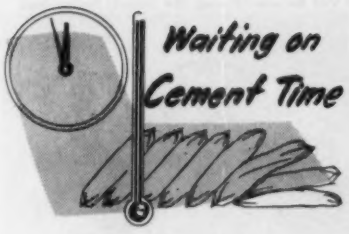


evaluation is not nearly as important as better supervision and the use of experienced personnel.

A review of electric-logging devices reveals that many new logging tools for measuring formation resistivity have been a valuable aid to exploration personnel. However, this type of review may also reveal that the new tools are run in addition to, not instead of, the old tools. There is some evidence that drill-stem testing may become a habit rather than a necessity for formation evaluation. For example, if cores have shown good hydrocarbon saturation, a drill-stem test serves no purpose. If the test is dry, production casing will probably be set based on core information. As a result the test was not justified.

In many areas drill-stem tests are still taken where they are no longer considered as reliable. This is not meant to suggest that drill-stem tests should not be taken, but instead to emphasize that before running such a test its exact purpose should be clearly defined.

This brief resume of formation evaluation has been presented and a few unjustified practices discussed because of the adverse effect that prolonged testing may have on well costs. Two drill-stem tests may require only 2 days of actual time; however, the effect of the tests on hole conditions



may require 10 days extra of rig time. An extra log may require only a few hours, but the extra time may result in several more rig-days as a result of hole trouble. There is every justification for using evaluation methods necessary for formation identification; however, there is also an obvious need for a careful analysis of how each tool run will aid in this identification.

Waiting-on-cement time. Another practice that costs additional dollars is that of prolonged periods of waiting on cement to set. In most instances there is no justification for waiting more than 12 hours for cement to set before drilling, and in many cases waiting times may be no more than 6 hours. Cement strength is developed fast as temperature increases. This is shown in the following table:

Setting Time-Hours	Temperature	Compressive strength-psi.
12	100	800
24	100	1,400
12	130	2,100
24	130	3,400

Of significance in this table is the fact that cement strength after 12 hours at 130° F. is 2,100 psi.; which exceeds the 24-hour strength of 1,400

psi. at 100° F. From this it can be concluded if 24 hours' waiting time at 100° F. was adequate, then 12 hours should be adequate when the temperature is 130° F. Actually the use of accelerators, such as calcium chloride, provide a much faster build-up of strength than shown in this table. It is possible to almost predetermine cement strength in any desired time interval with additives now available. As a result, long waits for cement to set are a needless waste of money.

Hole Trouble

The last major function that has a direct bearing on well time and thus well cost is hole trouble. It can be said that hole trouble extends the drilling time, or that extended drilling time causes hole trouble. There are

many types of well difficulties that classify as some sort of hole trouble. However, for the purposes of this and future discussions, only lost circulation, sloughing shale, crooked hole, and stuck pipe as the result of differential pressure will be considered.

Lost circulation. Probably the biggest single problem faced by the oil industry is that of controlling lost circulation. The loss of fluid occurs in normal and abnormal pressure areas, and the industry does not appear any closer to a solution at the present than 10 years ago. Work has shown the effect of running and pulling pipe in creating pressure surges and from this, the problem has been minimized. This has resulted in an emphasis on using thinner fluids, eliminating drill-pipe floats, and running pipe slowly through danger zones. However, the same materials are being used for controlling lost circulation, and the only change is a continuously increasing list of the same type of materials.

Sloughing shale has received the attention of engineers for many years.

TABLE 1—EFFECT OF CASING SIZE ON WELL COST

Casing	Casing size-o.d., in.	Wt.-lb./ft.	Type coupling	Grade	Cost/ft., $	Total cost $
Surface	8⅝	32.0	STC	J-55	3.69	3,690.00
Production	5½	17.0	LTC	N-80	2.54	19,050.00
Total cost						22,740.00
Surface	7	23.0	STC	J-55	2.68	2,680.00
Production	4½	11.6	LTC	N-80	1.80	13,500.00
Total cost						16,180.00

Congrats and $25 for this quip to G. A. KRAFT, 17 Van Berwoerdeweg, The Hague, Netherlands

To the men on the rig and the men at headquarters . . . Lone Star casing, tubing, and line pipe mean fine steel stamina and the convenience of quick supply so important in the oil and gas industry.

Quality control is basic at Lone Star . . . from ore to finished products. Ultra modern manufacturing facilities plus multiple, exacting inspections guarantee absolute satisfaction with Lone Star API Pipe.

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The problem has been minimized by recognizing the causes of sloughing. Where sloughing is caused by a washing out of formations, water loss has been reduced. Where hydration or clay swelling is the cause, inhibited muds, such as the gyp mud, have been used. If the sloughing results from the entry of high-pressure fluids or gas from shale zones, then mud weight must be increased.

The causes of crooked hole are generally attributed to high-angle dipping beds. The bit will tend to drill perpendicular to the angle of dip and the rate at which this occurs for a given drilling assembly generally is a function of the bit weight. Through research primarily by Woods and Lubinski, better stabilization has lessened crooked-hole problems. However, the problem is far from solved, and it is not uncommon to see an operator decrease bit weight to help straighten the hole. Partial solutions consist of relaxing hole-deviation requirements and an acceptance of methods for maintaining a minimum deviation.

The term, pipe sticking, is all-inclusive and may result from any of these hole problems. In addition, pipe sticking in many cases has been attributed to differential pressure sticking, commonly referred to as wall sticking. Research has shown analytically where this is not only possible, but is the probable cause in many areas. Models have been built to demonstrate this sticking. As a result, more effort has been made to keep pipe moving. Stabilizers have been used to prevent drill collars from lying flush against the wall of the hole. Results have shown a surprising decrease in pipe sticking, particularly in those areas where heavy-weight muds are commonly utilized.

Steel tonnage. Not many years ago, 7-in. o.d. pipe was a popular size for production casing. Later this size was reduced to 5½ in. o.d.; now the trend is to use casing size as small as 2⅜ in. o.d. This accelerated program of reducing steel requirements has resulted directly from the need for reducing initial well costs. Such programs are possible because of restricted producing rates, which reduce the need for more capacity, and the rapid development of tools for working in smaller casing.

Table 1 shows an example of the effect casing size will have on well cost in a 7,500-ft. well. Assumed length of surface casing is 1,000 ft.

The smaller casing provides a saving of $6,560. With no need for additional capacity, it is difficult to justify the larger casing, yet many operators still insist on the larger size. Future work will show in detail the advan-

tages of slim-hole drilling and reduced steel tonnage.

Cement materials. The unit cost of cement has been decreased by the use of slurry-increasing additives and increased by the introduction of special-purpose cements. Cementing costs may also be substantially increased by the addition of extra cementing equipment. Because of the complexity of determining the proper type of cement to use, the spacing of scratchers and centralizers, the proper pumping rates, and the calculation of volume requirements, many operators have abandoned the idea of using new developments.

Computers reduce cost, improve quality

THE CHEMICAL and oil industries are beginning to accept computer control in plants and refineries as a good way to reduce operating costs and improve product quality and yield.

Monsanto Chemical Co. first announced plans for a computer-controlled plant in December 1958. An ammonia plant was completed and put on stream at Luling, La., this month. So far, performance reportedly is up to expectations. Operation is being handled by an RW-300 digital control computer.

B. F. Goodrich Co. followed close on the heels of Monsanto by revealing, in January 1959, plans for a computer-controlled process for producing vinyl chloride monomer by cracking ethylene dichloride at its Calvert City, Ky., plant (OGJ, Oct. 5, 1959, p. 141). Control also is with an RW-300 digital computer. Goodrich says initial results, particularly in the logging of operational data, have exceeded expectations.

Texaco Inc. is one of the pioneers in computer-control installations in refineries. Texaco has been operating a catalytic polymerization unit with an RW-300 since March 1959. This digital computer has relieved the operators of all control functions except to observe how the computer is doing. A very high efficiency of 93% is being obtained on this poly unit (OGJ, Oct. 5, 1959, p. 140).

Standard of Ohio and Esso Research & Engineering Co. are among others considering plant control with digital computers.

There are admittedly some bugs still to be worked out before the present equipment is foolproof but the success of computers now in operation indicates that completely automated plants are much closer than many think.

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INDUSTRY

Graceful as a pillar in a formal garden . . beautiful (in its own way) as a southern belle in her bouffant best . . Lone Star pipe is truly the aristocrat of the industry.

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You save drilling dollars with

THE

MUD PROBLEM: Maintaining a stable lime mud at high temperature.

WELL DATA

Location: San Salvador Field, Hidalgo County, Texas
Total Depth: 16,684'
Bottom Hole Temperature: 356°F

MUD ADDITIVE PROGRAM

0'	to 4000'	Native mud plus AQUAGEL*
4000'	to 5800'	AQUAGEL, BAROFOS*, TANNEX* and caustic soda
	5800'	Converted to lime treated emulsion mud
5800'	to 9000'	CARBONOX*, lime, TANNEX, Caustic soda, IMPERMEX*, diesel oil
9000'	to 16,684'	CARBONOX (up to 20 lb/bbl of mud), caustic soda, lime, diesel oil; and MICATEX* and TUF-PLUG† in quantities from 10 to 30 lb/bbl of mud BAROID* was added as neccessary to control mud weight

TYPICAL MUD PROPERTIES

Depth	5850	7340	9229	12,057	14,918	16,684
Weight, ppg	10.2	12.2	15.5	17.3	18.0	19.1
Ave. sp gr, Solids	3.0	3.7	3.8	4.0	4.1	4.2
Viscosity, sec. API	43	44	54	63	78	58
Stormer Gel, 10 min	5	10	10	10	5	5
Filtrate, cc API	9.0	5.6	1.7	1.4	0.7	2.5
pH	11.8	11.5	12.0	12.5	12.5	12.4
Oil, %	10.0	10.0	12.0	11.0	10.0	9.0
Lime, excess ppb	1¼	1½	1	2	2½	1

CASING PROGRAM

Size Inches O.D.	*Depth Set Feet*
20	159
13⅜	2002
9⅝	8942
7	14921
5 (liner)	15960
3½ (liner)	16684

*Registered trademark of Baroid Division National Lead Company
†Registered trademark of Cherokee Laboratories, Inc.

PROBLEM: To maintain mud property stability at 356°F.

DISCUSSION: The problem of prevention of high temperature gelation, maintenance of desirable viscosity and filtration, and prevention of mud loss to formations became greater with increasing depth, mud weight and decreasing hole size. Additives used had to be compatible with all other materials in the mud and not adversely affect any other mud property.

SOLUTION: The best mud treatment was determined by conventional mud testing plus tests of treated samples aged at 25°F to 50°F above anticipated bottom hole temperatures. CARBONOX proved to be the best thinner for controlling high temperature gelation and viscosity and the most efficient additive for controlling filtration and filter cake thickness.

The Baroid Mud Centrifuge was used to separate and discard low specific gravity solids and reclaim 85 to 92% of the BAROID in the treated mud. The Mud Centrifuge helped achieve a reduction in mud maintenance cost of approximately 25%.

a Baroid Mud Program

MUD PROBLEM

... and its solution

This case history shows how a complete Baroid mud program gives you successful mud control under the most adverse conditions. In this instance problems included depth to 16,684 feet, bottom hole temperatures up to 356°F, mud weight up to 19.1 lb/gal, salt contamination and lost circulation.

Baroid engineered services and products, coordinated with a pilot-tested program, enabled operating crews to maintain a lime-treated oil emulsion mud that was always as thin as needed . . . that did not gel excessively at high temperature . . . that had low filtrate loss . . . and that cut mud costs by 25%.

Baroid's improved new concept of modern marketing methods gives you an integrated mud service assuring quality control of products, engineering accuracy and technical ability that combine to save *your* drilling dollars.

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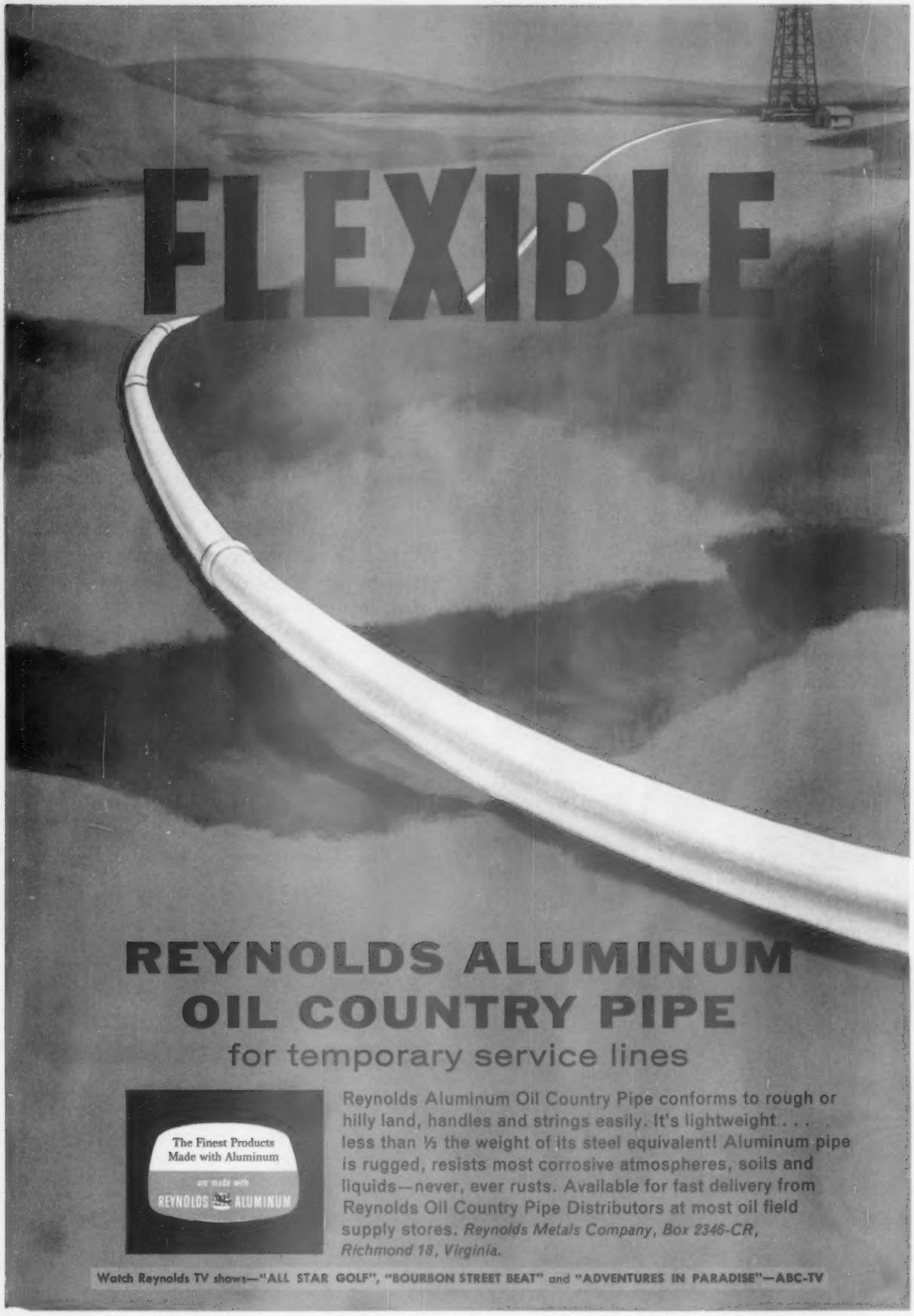

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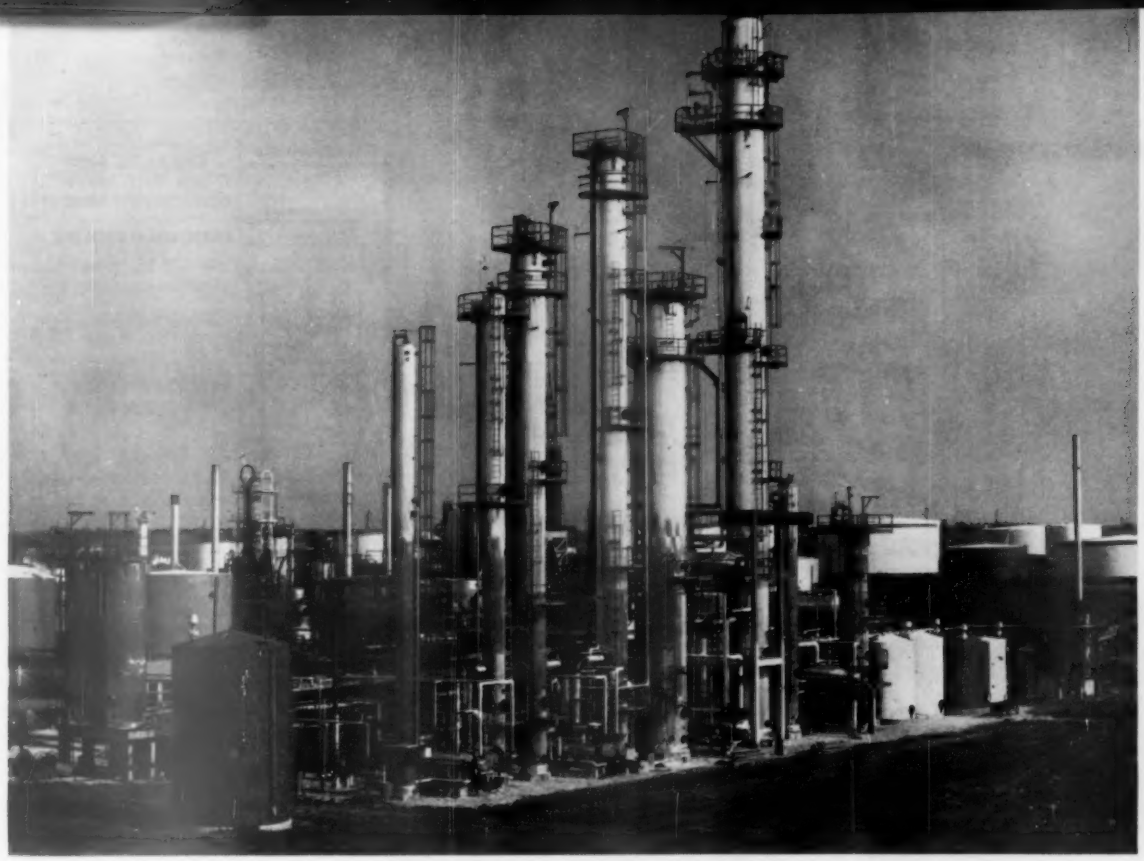


BTX UNIT is the first step in a petrochemical diversification program for Vickers.

PROGRESS REPORT

"Operating cost lowest in the industry"

. . . Says Vickers of its 2-year-old Udex unit

A 2,320 BBL. per stream day (design capacity) Udex unit is operated by Vickers Petroleum Co. at the Potwin, Kans., refinery. This unit, licensed and designed by Universal Oil Products Co., and erected by Procon, Inc., was placed in operation as the first step in a petrochemical diversification program. The $2,500,000 unit came on stream in mid-1958 and has operated trouble-free since startup.

The high - purity benzene - toluene-xylene (BTX) recoveries run 95% and higher at design conditions and the recovery of solvent-grade heavy aromatics is consistently 70% and higher. This is accomplished with a mixed glycol solvent of 75% diethylene glycol (DEG) and 25% dipropylene glycol (DPG).

A rerun column is provided in the finishing section to make specialty solvents from the postxylene fraction. These are high-flash solvents made up largely of C_9 to C_{11} aromatics, and sold under the trade designations V-100, V-110, and V-120.

Udex byproducts are valued highly. They make good blend material for both premium and regular gasoline pools and give Vickers self-sufficiency in octanes without the use of alkylate. The raffinate, which ordinarily would go to premium only (as reformate) gives much flexibility to the gasoline pool.

Operating cost is the lowest reported in the industry. Solvent consumption is extremely low, clay life long, and maintenance a minimum.

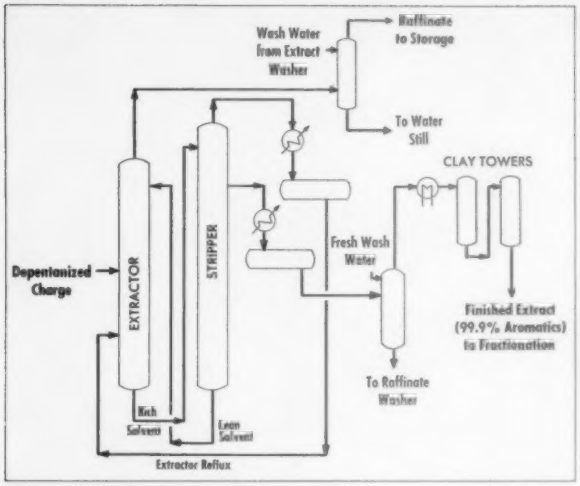
Extractor operation: Grote[1] has recently reviewed the Udex process and how it may be used in different ways for aromatics production and for octane-separation schemes. Grote noted the use of mixed glycol solvents and proper water content, tailored for a given application, and of raffinate splitting.

BY GORDON D. KERNS
Technical Director
Vickers Petroleum Co., Inc.

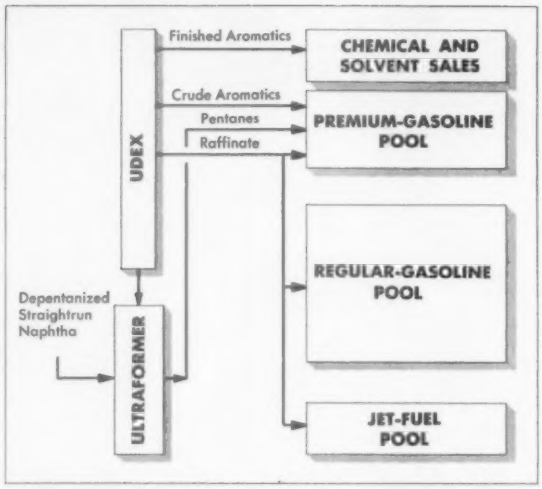
The Vickers unit uses the mixed-solvent scheme but otherwise is set up to operate largely in a conventional manner, as can be seen by the simplified flow sheet, Fig. 1. The unit is processing about 2,400 bbl. per stream day of depentanized reformate of approximately 375° F. e.p.

Results of typical extractor recovery surveys are shown in Table 1. Such high recoveries as these are not made at sacrifice of product quality. As can be seen from Table 2, products meet or exceed the strictest specifications in the industry.

The only product problem encountered during initial operation occurred in a short period when benzene purity was limited to 5.20° C. freeze point (99.5 mole % purity). This was found



UDEX UNIT uses a mixed glycol solvent to obtain better than 95% recovery of high-purity benzene-toluene-xylene fractions. Fig. 1.



BYPRODUCTS make good blend material for both premium and regular-gasoline pools to provide sufficient octanes without use of alkylate. Fig. 2.

to be contamination of extract by traces of pentane and hexane in the gas blanket on the extract accumulator. Substitution of natural gas for refinery gas eliminated this source of contamination, and the freeze point was raised to 5.45° C. (99.9 mole % purity) soon thereafter.

Blending. How Vickers uses Udex byproducts to balance gasoline pool octanes is shown in Fig. 2. Octane blend values in the gasoline pools are given in Table 3.

Mixed aromatics going to the premium pool give control of motor octane as well as research octane. Blending octanes obtained are an F-1 octane of 108 at 3cc. TEL, and an F-2 octane of 96 at 3cc. TEL. About 120 bbl. of mixed aromatics is used to replace 100 bbl. of 400° F. e.p. alkylate. (Data on blending of C_8 aromatics in base stocks have been given by Trew and Howells[2]).

Ultraformer feed is depentanized and the reformate which is fed to the Udex is also depentanized. A 2.5-psi.-R.v.p. raffinate is thus made off the Udex unit, which is a very valuable blending agent for balancing the distillation properties of both regular and premium gasolines. In addition to the Vickers-branded products, the refinery also makes a 91.0 - research - octane-number regular which meets Great Lakes and Kaneb pipeline requirements and a similar pipeline premium at 99.0 research and 89.0 motor octane number.

Solvents and clay. Solvent consumption in the unit has been very low. Total losses for the unit have averaged

TABLE 1—AROMATICS RECOVERY IN VICKERS UDEX UNIT

Solvent-to-feed ratio, V/V	5.94	7.38	8.72
Lean solvent temperature, °F.	300	300	293
Lean solvent composition, Wt. %			
DEG	66.9	67.6	68.9
DPG	26.0	26.0	24.0
Water	7.1	6.4	7.1
Extractor recoveries, vol. %			
Benzene	100.0	100.0	100.0
Toluene	99.1	99.5	100.0
Xylene	84.4	96.7	94.9
Heavy aromatics	75.4	83.0	71.1
Total	84.0	93.8	91.2

TABLE 2—LABORATORY INSPECTIONS OF PRODUCTS

	Benzene	Toluene	Xylenes	Solvent V-110 (Xylene bottoms)
Sp. Gravity	0.883	0.871	0.871	0.884
Dist., D-850, °C.				
I.b.p.	78.7	109.1	137.4	161.7
5%	78.7	109.2	137.8	162.8
10	78.7	109.2	138.0	163.9
50	78.8	109.3	138.6	167.7
90	78.8	109.3	139.6	178.8
95	78.8	109.4	140.4	188.0
D.P.	78.8	109.4	141.8	216.0
Bar. Corr. °C.	1.36	1.36	1.36	.....
Flash pt., TCC, °F.	.....	.....	84	110
Freeze pt., °C.	5.49	.....	.....	.....
Paraffins	.....	0	0	.....
Acid wash color	0	0	0	.....
ASTM color	Water white	Water white	Water white	0-1
Acidity	Neg.	Neg.	Neg.	.....
Sulfur compounds	Neg.	Neg.	Neg.	.....
Copper corrosion	Neg.	Neg.	Neg.	.....
Thiophene	Nil.	.....	.....	.....
Doctor test	Sweet	Sweet	Sweet	Sweet
Mixed aniline pt., °C.	.....	.....	10.5	.....
Kauri butanol	.....	.....	98.5	95.3

TABLE 3—OCTANE-BLEND VALUES IN VICKERS GASOLINE POOLS

Aromatics pressured to 10.5-psi. R.v.p. with refinery butanes	In premium pool		In regular pool	
	F-1 Cl.	F-1 at 3.0 cc. TEL	F-1 Cl.	F-1 at 3.0 cc. TEL
Benzene	.....	.....	106.7	109.5
Toluene (0-5%)	105.0	105.0	110.2	109.5
Toluene (5-30%)	108.5	108.5	.....	.....
Xylene (0-5%)	105.0	107.7	109.2	111.0
Xylene (5-30%)	108.5	107.7	.....	.....
V-100 (0-5%)	106.7	109.5	110.0	109.5
V-120 (0-5%)	.....	.....	109.2	106.7
Raffinate	68.2	84.7	62.0	83.5
	F-2 Cl.	F-2 3.0 cc. TEL		
Toluene (C-5%)	92.5	95.5		
Xylene (0-5%)	86.0	96.5		
Xylene (5-30%)	93.7	96.5		
V-100 (0-5%)	94.7	95.7		
Raffinate	70.2	86.5		

0.047 lb. per bbl. of charge. Spot surveys of process losses have been as low as 0.007 and 0.018 lb. per barrel. This is credited to good operation of the water-wash towers which wash glycol from raffinate and extract streams, and of the water still which reprocesses this lean aqueous glycol. The 3-month averages below are typical for current operations:

	Extract	Raffinate	Water still overhead
Wt. % glycol	0.001	0.05	0.01

Due to an efficient clay-tower arrangement recommended by the licensor soon after startup, this unit has always enjoyed inexpensive clay finishing of extract.

Hot extract is percolated through a bed of clay to polymerize and remove trace olefins. Two clay towers are provided, although the interval between clay changes normally is quite long. Provision of a second clay tower not only insures uninterrupted operation but also has made possible the exceptional clay life. When a bed has become spent as indicated by a bromine index (BI) of 15-20 on the effluent, the freshly charged bed is put in service in series flow. The fresh-clay bed acts as a cleanup treater while the spent bed treats feed from about 300 BI down to about 25 BI. When the extract between the two beds reaches 100 BI, the spent bed is dumped and recharged. In this way, Vickers has achieved a clay life in excess of 10,000 bbl. of extract per ton, making treating expense a negligible cost factor.

Maintenance and technical service. Maintenance and technical troubleshooting have been very minor. A survey of extractor recoveries is taken once per month which requires about 2 technical man-hours and 10 nontechnical man-hours. Apart from this, no process engineer's time is required by the unit, making technical service expense essentially just control-laboratory costs.

Annual maintenance cost currently is about 0.5% of investment for materials and 9,700 man-hours of labor. This is quite economical, even for a new unit, if contrasted with industry averages for solvent-extraction units,[3] which run 3-5% of investment.

In its initial operation at the Potwin refinery, Vickers' Udex unit has set a new standard for economical operation.

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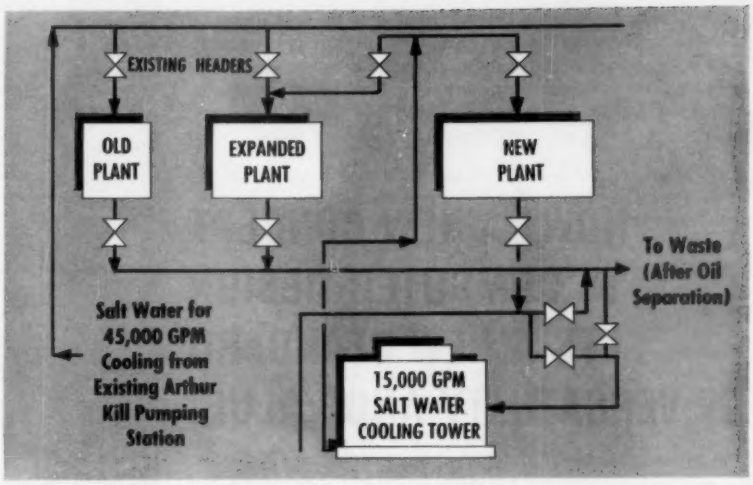
3. Nelson, W. L., Process Unit Maintenance, The Oil and Gas Journal, October 13, 1958, p. 114.


EXISTING HEADERS
OLD PLANT
EXPANDED PLANT
NEW PLANT
To Waste (After Oil Separation)
Salt Water for 45,000 GPM Cooling from Existing Arthur Kill Pumping Station
15,000 GPM SALT WATER COOLING TOWER

FLASH DIAGRAM of California Oil Co.'s salt-water circulating system at Perth Amboy, N. J.

The California Co. reports

Savings from new cooling tower

BY JOSEPH J. FINNERTY
Project Engineer,
Cooling Tower Department,
Foster Wheeler Corp.,
San Mateo, Calif.

CONFRONTED with increased demands for cooling water in its Perth Amboy, N. J., refinery, The California Oil Co., a subsidiary of Standard Oil Co. of California, decided to install a 15,000-g.p.m. salt-water induced-draft counterflow cooling tower.

The wisdom of this choice has been borne out through successful operation of the tower, reputed to be the first of its kind operating in this field. The unit offers an example of the savings which can be made by resorting to cooling towers instead of expanding existing circulating facilities, even when the supply is salt water.

The refinery's cooling water originally was supplied from a nearby creek. Discharge of hot waste water by upstream industries often caused the water temperature to rise to 95° F. during the summer.

When the plant was expanded in 1950, the refinery switched to the cooler salt water of Arthur Kill, an arm of lower New York Bay, by building a 45,000-g.p.m. pumping station. But, by 1956, the cooling water demand had reached the Arthur Kill station's capacity.

When analyzing the various solutions proposed to furnish more cooling water, Standard engineers estimated that it would cost about 65% more to expand the existing once-through salt-water system than to install a salt-water cooling tower. A fresh-water tower was ruled out since the 640,000 gal. per day required for makeup was far in excess of the available supply.

Adapted from a paper presented to the South Texas section of ASME, Houston.

The cooling-tower unit was built in two sections. The first handles 6,000 g.p.m.; the second unit cools 9,000 g.p.m. from 110.5° F. to 82.5° F. when air is at a wet-bulb temperature of 77° F.

While having the same general outward appearance as a fresh-water tower and operating on the same principle, the unit was specifically designed for salt-water service from both thermal and structural viewpoints.

California redwood is used throughout, with the bottom 9 ft. of posts coated with creasote to prevent attack by marine borers. All structural fastenings are silicone bronze, while the casings of motors and gears, coupling flanges and shaft, support steel, and water-inlet flange are coated.

To avoid salt-water corrosion of surrounding facilities, it was necessary to minimize spray loss. This was achieved by installing two-pass drift eliminators, increasing the height between eliminators and the roof, and using a low exit-air velocity.

Tower-cooled water is discharged to the existing supply header where it blends with flow from the Arthur Kill pumping station. This makes the tower only partially recirculating and no direct blowdown is needed. At design flow conditions, the 15,000 g.p.m. which circulates over the tower represents about 25% of total cooling-water requirements.

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SETS A NEW STANDARD
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Wide range of applications: the RPC-4000 has been designed for engineering, scientific, business data processing and management control functions. Such jobs as product and process design, statistical analysis, research, inventory control, payroll and sales analysis are all well within its capabilities.

Easy to use: the RPC-4000 is simple to program and operate. Royal McBee compiling and translating routines allow even non-technical personnel to obtain maximum results. Versatile command structure gives programming speed and flexibility.

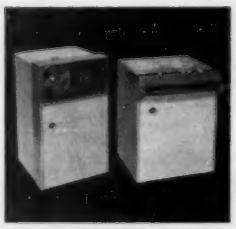
Available at low cost: high capacity, flexibility and ease of operation make the RPC-4000 the outstanding computer value on the market today.

Minimum operating costs: the RPC-4000 requires no site preparation or special maintenance. It is powered from any ordinary wall outlet.

Continuing assistance: users benefit from free training, an information exchange service, and library of programs.

Heart of the RPC-4000 system is a new transistorized computer with advanced design concepts that provide substantial computing speed and capacity in a low-cost unit. Magnetic memory drum stores *8008 words*. Operating speeds are as high as 230,000/minute.

Standard input-output is a tape typewriter system which includes a Royal electric encoding-decoding typewriter complete with desk and chair, plus a tape punch-read console. Read speed is 60 characters/sec., punch speed 30 characters/sec. Typewriter, punch and reader may be interconnected in any combination for both on-line and off-line operations.



A new 500 character/sec. photoelectric tape reader and a 300 character/sec. punch are available as optional input-output equipment. A magnetic tape unit and a line printer will be available soon. As many as 17 input-output devices (60 with minor modification) may be connected on-line to the basic system. All peripheral equipment is under automatic program control of the computer.

Royal Precision Corporation

Royal Precision is jointly owned by the Royal McBee and General Precision Equipment Corporations. RPC-4000 sales and service are available coast-to-coast, in Canada and abroad through Royal McBee Data Processing Offices. For full, detailed specifications on the new, transistorized RPC-4000, write **ROYAL McBEE** data processing division, Port Chester, N.Y.

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Do other countries have depletion allowance?

Do foreign countries have a depletion allowance on oil production or is this a United States policy? R.V.L.

The allowance of depletion is a fairly well established legal practice. It rests upon the fact that oil is one form of capital. Capital is not taxable (although some violations of this principle are beginning to appear) and hence oil-production income is excused in part from taxes. Other mineral rights have been granted similar but unusually lower allowances (see "The Case for 27½% Depletion," OGJ, Feb. 23, 1959).

Changes may have occurred recently but from information now available to this department, the following governments allow depletion of oil income:

Bolivia (27%)	India
Canada (33⅓ and 25%)	Pakistan
Colombia (10 to 50%)	Peru
Guatemala (27½%)	Turkey
France	Trinidad
Libya	

What temperatures do asphalt-handling operations require?

We find little about the viscosity of asphalt. To what temperature must we go for various handling operations? Wm. T. E.

In Fig. 1 is shown the viscosity of 100 penetration asphalt taken from the fourth Edition of Petroleum Refinery Engineering (McGraw-Hill Book Co., Inc., N. Y., 1958) as well as maximum viscosity Bunker C fuel oil for comparison. Also plotted are a number of points for 100 and 40 - 50 penetration asphalt taken from U. S. Bureau of Mines data (Stanfield and Hubbard, "Asphalts from Rocky Mountain Crude Oils," Tech. Paper 717, published in 1949). Finally, the viscosities of three 85-100 penetration asphalts from the Asphalt Institute (J. M. Griffith, "Viscosity: A Key to Better Asphalt Road Construction"), are shown.

The following tabulation indicates temperatures or viscosities that have been suggested for the handling of asphalt:

450°-475° F.: Insulated railroad tank cars.

450° F.: Loading drums through jacketed line.

350°-400° F.: Tank trucks having steam heater coils.

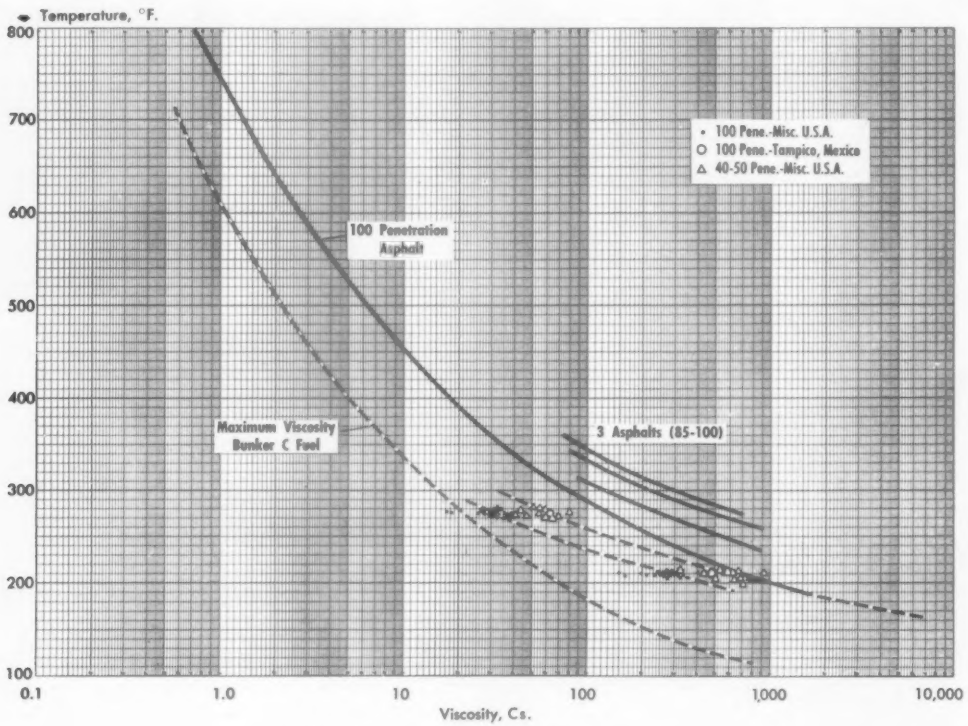
375° F.: Spraying earthen irrigation canals.

220-310 cs.: Mixing with coarse aggregate.

160-240 cs.: Mixing with fine aggregate.

100-220 cs.: Spraying of open surfaces for sealing.

50-100 cs.: Spraying of dense surfaces.



VISCOSITY of asphalts (approximate). Fig. 1.

Monthly Report on PIPELINE CONSTRUCTION

PIPELINE ACTIVITY reported here is compiled from surveys by The Oil and Gas Journal among pipeline companies and construction contractors.

This summary report appears in the last issue of the Journal each month. New construction projects are reported weekly in Pipeline Briefs in the Journal's news section.

Projects are listed in three groups—U. S., Canadian, and Foreign—and according to type of line—crude, products, or natural gas.

★ The star symbol indicates the first appearance of the project in the Journal's survey.

U. S. Crude Oil Pipelines

Cape Pipe Line Co. (Sun Oil Co., Cities Service Co., Atlantic Refining Co.), Philadelphia.

Project: Line from lower Delaware Bay to Philadelphia.

Status: Planned.

Cooperative Refinery Association, Kansas City, Mo.

Project: 6 miles of 6-in. at Stockton, Kans.

Status: Planned.

Completion: Spring 1960.

Gillette Pipeline, Inc., and **A. W. Hartwig, Inc.**

Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.

Status: Pending Wyoming Public Service Commission approval.

International Oil Pipeline Corp., New York City.

Project: Would own U. S. section of 1,500-mile, 30-in. line proposed by Mid-Continent Pipe Lines, Ltd., from Edmonton, Alta., to Chicago. (See Canadian Crude-Oil Pipelines).

Status: Proposed.

Magnolia Pipe Line Co., Box 900, Dallas, Tex.

★ Project: 33 miles of 12-in. in Cameron Parish, Louisiana.

Status: Under way.

Contractor: **Sharman, Allen, Gay & Taylor, Inc.,** Houston.

Matador Pipe Line Corp., Denver, Colo.

★ Project: 175-mile line to carry crude from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man., where it would tie in with the Interprovincial pipeline.

Status: Proposed. Representatives of Western Crude Marketers, Inc., Denver, have been conducting feasibility studies in North Dakota. Matador's application is pending before the Canadian Parliament.

Completion: Tentatively early summer 1960.

Standard Oil Co. of California, San Francisco.

Project: 22 miles of 8-in. from Swanson River Unit on Kenai Peninsula to Nikiski on Cook Inlet, Alaska.

Status: Planned.

U. S. Products Pipelines

Humble Oil & Refining Co., Houston.

Project: About 34 miles of 4-in. line to move propylene from Baytown refinery to petrochemical plant at Texas City.

Husky Oil Co., Cody, Wyo.

Project: About 100 miles from Cody to the Yellowstone products line west from Billings, Mont.

Status: Planned.

Completion: Late 1960.

Magnolia Pipe Line Co., Box 900, Dallas, Tex.

★ Project: 60 miles of 6-in. LPG line from Hull to Beaumont and Orange, Tex.

Status: Bids received.

Mid-America Pipeline Co., (Missouri-Kansas-Texas Railroad), New York.

Project: 2,500-mile LPG system from West Texas-New Mexico area to upper Midwest. Main line would be 1,500 miles, with extensive gathering systems, to connect gasoline plants in West Texas, southeastern New Mexico, and Texas Panhandle. The line from the Southwest would fork at McPherson, Kans., with one branch going to Minneapolis and the other to Madison, Wis. Size of pipe would be 8 and 10-in. with branches 6 to 8-in.

Status: Planned. Project will be started first half of 1960, possibly in February.

Contractor: **Williams Brothers Co.,** Tulsa, has engineering, management, and construction.

Completion: Fall 1960.

U. S. Natural Gas Pipelines

Anchorage Gas Corp., Houston.

Project: 165 miles of line at least 12-in. in diameter from Kenai Peninsula to Anchorage.

Status: Planned. Construction may start late April or early May 1960.

Arkansas Industrial Pipeline Corp. (Arkansas Louisiana Gas Co.), Shreveport, La.

Project: 130 miles of 18-in. from Perla to Helena, Ark.

Status: Planned.

Completion: 1960.

Arkansas Louisiana Gas Co., Shreveport, La.

Project: About 58 miles of 2, 3, 4, and 6-in. line in various locations.

Status: Planned.

Completion: 1960.

Atlantic Seaboard Corp., Box 1273, Charleston, W. Va.

★ Project: 43 miles of 20-in. line from the Seneca compressor station in Pendleton County to the Terra Alta storage project in Preston County, West Virginia.

Status: Temporary authority granted by FPC.

Carolina Pipeline Co., Columbia, S. C.

Project: 85 miles of 8-in. in South Carolina.

Status: Pending FPC approval.

Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.

Project: About 16 miles of 10-in. from Sleightsburgh to Highland, N. Y.

Status: Planned.

Completion: November 1960.

Coastal States Gas Producing Co., Corpus Christi, Tex.

Project: 60 mile sof 10-in. in La Salle and Frio counties, Texas.

Status: Planned.

Completion: June 1960.

Coastal Transmission Corp., Houston.

Project: 65 miles of 3, 4, 6, and 10-in. in Texas and Louisiana.

Status: Pending before FPC.

Completion: Summer 1960.

Colorado Interstate Gas Co., Colorado Springs, Colo.

Project: 109 miles of 26-in. from Four-Way station in Texas Panhandle, to Morton Junction in southeastern Colorado; 135 miles of 34-in. from there to Pueblo, and 107 miles of 30-in. on to Denver; 148 miles of 34-in. from CIG line at Rock Springs, Wyo., to Provo, Utah, to connect with proposed El Paso Natural Gas Co.'s line to California.

Status: Pending FPC approval.

Completion: 1960.

Project: 32 miles of 6-in. from Central Colorado to Trinidad.

Status: Awaiting FPC approval.

Completion: 1960.

Colorado Oil & Gas Corp., Denver.

Project: 402-mile line from Gubik field to Fairbanks, Alaska.

Status: Proposed.

Columbia Gulf Transmission Co., Houston.

Project: 10 miles of 12-in. supply loop to Erath field, Vermilion Parish, Louisiana, and 9 miles of various-size field lines in Acadia and Vermilion parishes, Louisiana.

Status: Approved.

Project: 10 miles of 20-in. loop in Jefferson Davis and Vermilion parishes, Louisiana, and 3 miles of 6-in. loop in Cameron Parish, Louisiana.

Status: Approved.

Consumers Power Co., Jackson, Mich.

Project: 121 miles of 26-in. from the Indiana - Michigan border to Northville, Mich., and 22 miles of 24-in. from Northville to Clarkston, Mich.

Status: Under way.

Contractor: **Cape Construction Co., Inc.,** Cape Girardeau, Mo.

Completion: March 1960.

El Paso Natural Gas Co., Box 1492, El Paso, Tex.

★ Project: 64 miles of various small-diameter gathering line in Beaver and Ellis counties, Oklahoma, and Hemphill, Lipscomb, and Ochiltree counties, Texas.

Status: Pending FPC approval.

★ Project: 39 miles of gathering line in the East Maljamar and Kemnitz areas, Lea County, New Mexico.

Status: Approved.

★ Project: 17 miles of 5-in. lateral from an interconnection with Pacific Gas Transmission Co.'s proposed 36-in. line in Klamath County to near Klamath Falls, Ore.

Status: Pending FPC approval.

Project: 34.2 miles of 20-in. from Puckett, Tex., to Goldsmith plant; 51.3 miles of 20-in. from Terrell to Puckett Plant discharge; and 23 miles of 20-in. from Goldsmith to Eunice-Dumas line.

Status: Pending FPC approval.

Project: 244 miles of 30-in. Permian-San Juan Line loops.

Status: Under way.

Contractor: **R. H. Fulton & Co.,** Lub-

Frank Friedli, *Manager,*
En-Tronic Controls Division,
The Cooper-Bessemer Corporation,
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PIPELINE CONSTRUCTION

bock, Tex., has contract for 126 miles in New Mexico, with office in Tatum, N. M.

Project: 395 miles of 34-in. from Salt Lake City, to California border near Las Vegas, Nev.

Status: Pending FPC approval.

Completion: January 1, 1961.

Equitable Gas Co., 420 Boulevard of the Allies, Pittsburgh, Pa.

★ Project: 58 miles of 16 and 20-in. from Marion County, West Virginia, to Washington County, Pennsylvania.

Status: Pending FPC approval.

Completion: Fall 1960.

Project: 17 miles of 16-in. in Marion and Monangalia counties, West Virginia.

Status: Pending FPC approval.

Completion: October 31, 1960.

Project: 3½ miles of 20-in. in Greene County, Pennsylvania.

Status: Pending FPC approval.

Completion: October 31, 1960.

Gulf Resources, Inc., New York.

Project: 136 miles of 14 and 20-in. from Hidalgo County to LaSalle County, Texas.

Status: Pending FPC approval.

Hope Natural Gas Co., Clarksburg, W. Va.

Project: 20 miles of 24-in. line in Wetzel and Monongalia counties, West Virginia, replacing two 16-in. lines.

Status: Approved.

Houston Texas Gas & Oil Corp., St. Petersburg, Fla.

Project: 63 miles of 2-in., 12 miles of 3-in., 80 miles of 4-in., and 34 miles of 6-in.

Status: Pending FPC approval.

Completion: 1960.

Iron Ranges Natural Gas Co., St. Paul.

Project: 79 miles of 10 and 12-in. from Grand Rapids to Hoyt Lake, Minn., and 67 miles of 12-in. from Duluth to Silver Bay, Minn.

Status: Approved by FPC.

Completion: 1960.

Iroquois Gas Co.

Project: 9.5 miles of 16-in. in Erie County, New York.

Status: Pending FPC approval.

Kansas-Nebraska Natural Gas Co., Inc., Phillipsburg, Kans.

Project: 15½ miles of 12-in. main-line loop.

Status: Approved by FPC.

Laclede Gas Co., St. Louis, Mo.

Project: 107 miles of 24-in. between Hallsville, and St. Louis, Mo.

Status: Proposed.

Lone Star Gas Co., Dallas, Tex.

Project: 40 miles of 12-in. in Eastland and Callahan counties, Texas.

Contractor: Company crews.

Completion: May 1, 1960.

Manufacturers Light & Heat Co., Union Trust Building, Pittsburgh 19, Pa.

★ Project: 66 miles of 20-in. from Abbottstown to the Fulton-Franklin county line in Pennsylvania.

Status: Planned.

Completion: October 1960.

★ Project: About 21 miles of 20-in. in Fayette County, Pennsylvania.

Status: Planned.

Completion: October 1960.

★ Project: 5 miles of 20-in. in Monongalia County, West Virginia.

Status: Planned.

Completion: October 1960.

Michigan Wisconsin Pipe Line Co., Detroit, Mich.

Project: 188 miles of 30-in. and 341 miles of 24-in. main-line loop.

Status: Pending FPC approval.

Completion: By September 1, 1960.

Project: 31 miles of 24-in. loop in Illinois; 17 miles of 24-in. loop in Indiana; and 18 miles of 24-in. loop in Michigan.

Status: Conditionally approved by FPC.

Completion: October 1960.

Project: 69 miles of 24-in.; 28 miles of 20-in.; 96 miles of 16-in.; 29 miles of 8-in.; and 32 miles of 4-in. in Wisconsin.

Status: Conditionally approved by FPC.

Completion: October 1960.

Project: 65 miles of 24-in. loop in Kansas.

Status: Approved.

Completion: Summer 1960.

Midwestern Gas Transmission Co., Houston.

Project: 504 miles of 24-in. from Emerson, Man., to Marshfield, Wis., plus 54 miles of sales laterals.

Status: Approved by FPC.

Completion: 1960.

Mississippi River Transmission Corp. (Mississippi River Fuel Corp.), St. Louis.

Project: 115 miles of 24-in. from near Oran in southeast Missouri, north between Ste. Genevieve and Bonne Terre into vicinity of Herculaneum and Pevely then into St. Louis County.

Status: Planned.

Completion: Last half 1960.

Natural Gas Pipeline Co. of America, Chicago.

Project: 151 miles of 36-in. intermittent sections paralleling mainline facilities between Ford County, Kansas, and Joliet, Ill.

Status: Pending FPC approval.

Completion: Fall 1960.

Project: 180 miles of 24-in. between Kiowa County, Oklahoma, and Minneola, Kans.

Status: Pending FPC approval.

Completion: Fall 1960.

Project: 29 miles of 10 and 12-in. in Love County, Oklahoma.

Status: Under way.

Contractor: **R. H. Fulton & Co.,** Lubbock, Tex.

Completion: March 18, 1960.

Niagara Mohawk Power Corp., Syracuse, N. Y.

Project: 104 miles of 12-in. from Watertown, N. Y., to Massena, N. Y.

Contractor: **Fulghum Contracting Corp.,** Harrisburg, Pa.

Northern Natural Gas Co., Omaha, Neb.

Project: 217 miles of main line, 221 miles of main-line loops, and 2,178 miles of branch lines of various diameters.

Completion: 900 miles were completed in 1959.

Project: 36.5 miles of 2 to 16-in. gathering lines at Otis gas field, Rush County, Kansas, for underground storage, and 36.7 miles of 30-in. transmission line connecting Otis storage area to main line at Bushton, Kans.

Status: Pending FPC approval. ,

Project: About 21 miles of 16-in. and 26 miles of various small diameter pipeline in the Glick field, Kansas, area in Kiowa, Comanche, and Barber counties.

Status: Pending FPC approval.

Project: 188 miles of 24-in. and 215 miles of 30-in. from Farmington, Minn., to International border.

Status: Proposed.

★ Project: 83 miles of 20-in. from East Dubuque, Ill., to Janesville, Wis.

Status: Pending FPC.

Completion: Fall 1960.

Ohio Oil Co., Findlay, Ohio.

Project: 20 miles of gathering line to move casinghead gas to proposed natural-gasoline plant in south central Michigan.

Oklahoma Resources Development Co., Cameron Building, Oklahoma City.

Project: About 170 miles of 12-in. trunk line from Oklahoma City to Harrah and Muskogee, Okla., and about 130 miles of 4 to 12-in. lateral from the Greasy Creek area of Hughes County and from Blaine and Logan counties.

PIPELINE CONSTRUCTION

Status: Planned.
Completion: November 1, 1960.

Pacific Gas & Electric Co., San Francisco.
Project: 120 miles of 34-in. looping of Topock-Milpitas main line.
Status: Planned. Pending FPC approval.
Completion: 1961.
Project: 11 miles of 20-in. from Pittsburg to Walnut Creek, Calif.
Contractor: Using company crews.
Completion: 1960.
Project: 296 miles of 36-in. from the California-Oregon border to Antioch, Calif. (This is part of the project to import natural gas from Canada, which will include the Pacific Gas Transmission project listed below.)
Status: Pending approval from governments.
Completion: 90 miles scheduled for completion in 1960, the rest in 1961.

Pacific Gas Transmission Co. (Pacific Gas & Electric, San Francisco).
Project: 614 miles of 36-in. from Kingsgate, B. C., to California border near Klamath Falls, Ore.
Status: Pending approval of FPC and Canadian authorities to import gas.

Pacific Lighting Gas Supply Co., Los Angeles.
Project: 116 miles of 34-in. from Needles to Newberry, Calif.
Status: Under way.
Contractors: **Engineers Limited Pipeline Co.,** San Francisco, and **Pacific Pipeline Construction Co.,** Montebello, Calif. **Missouri Valley Dredging Co.,** Omaha, has contract for a dual 24-in. crossing of the Colorado River near Needles.

Pacific Northwest Pipeline Corp., Salt Lake City, Utah.
Project: 18 miles of 20-in. and 40 miles of 16-in. from main line near Camas, Wash., to Salem, Ore.
Status: Pending before FPC.
Completion: 1960.
Project: 60 miles of 12-in. from Salem to Eugene, Ore.
Status: Planned.
Completion: 1960.
Project: 61 miles of 4, 6, and 8-in. gathering line in Big Piney field, Wyoming.
Status: Planned.
Completion: 1960.
Project: 9 miles of 12-in. gathering line in Red Wash field, Uintah County, Utah.
Status: Planned.
Completion: 1960.

Peoples Gulf Coast Natural Gas pipeline Co., Chicago.
Project: 371 miles of 30-in. loop of present system between Texas and Chicago.
Status: Pending FPC approval.
Completion: 1960.
Project: 10.6 miles of 8-in. in Starr and Hidalgo counties, Texas.
Status: Pending FPC approval.

Peoples Natural Gas Co., Pittsburgh, Pa.
Projects: 38 miles of 12 and 20-in. in various parts of Pennsylvania.
Status: Planned.
Completion: 1960.

Phillips Petroleum Co., Bartlesville, Okla.
★ Project: 17 miles of 3 to 16-in. gathering lines in central Oklahoma.
Status: Under way.
Contractor: **George W. Davis Construction Co.,** Oklahoma City.
Completion: Indefinite.
★ Project: 37 miles of 3 to 8-in. gathering lines in northern Eddy County, New Mexico.
Status: Under way.
Contractor: **Lasley Construction Co.,** Hobbs, N. M.
Completion: March 1, 1960.

Pioneer Natural Gas Co., Amarillo, Tex.

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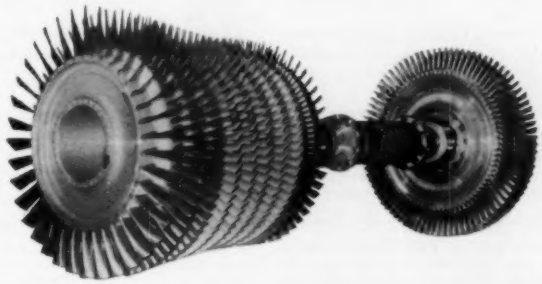

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PIPELINE CONSTRUCTION

Project: 21 miles of 12-in. from Sudan to Muleshoe, Tex.

Status: Pending FPC approval.

Project: 12 miles of 10-in. from Muleshoe, Tex., northward.

Status: Pending FPC approval.

Public Service Co. of North Carolina, Gastonia, N. C.

Project: About 47 miles of 4, 8, and 10-in. in North Carolina.

Rocky Mountain Natural Gas Co.

Project: 65 miles of gas line in southwestern Colorado to supply Collbran, Montrose, Delta, and Orchard City.

Status: Planned.

Shamrock Oil & Gas Corp., Amarillo, Tex.

Project: 70 miles of 16-in. from Ochiltree to McKee in the Texas Panhandle, to move wet gas to a plant where liquids will be removed.

Completion: June 1, 1960.

South Texas Natural Gas Gathering Co. (Coastal States Gas Producing Co., Corpus Christi, Tex.)

Project: 125 miles of 8, 10, 14, 18, and 20-in. line in Jimm Hogg County, Texas.

Status: Under way.

Contractor: **O. R. Burden Construction Corp.,** Tulsa.

Completion: March 1960.

Southern California Gas Co., Los Angeles.

Project: 13 miles of 34-in. from San Fernando Valley (Los Angeles) to West Los Angeles.

Status: Approved.

Completion: 1960.

Southern California Gas Co. and **Southern Counties Gas Co. of California,** Los Angeles.

Project: 93 miles of 34-in. from Ivanpah (near California-Nevada border) to Newberry, Calif.

Status: Pending FPC approval.

Completion: 1961.

Project: 115 miles of 36-in. from Newberry to Placentia, Calif.

Status: Pending FPC and state approval. Bids received February 9.

Completion: August 1960.

Tennessee Gas Pipeline Co., Box 2511, Houston, Tex.

★ Project: 155 miles of 30 and 36-in. loops in Ohio, Pennsylvania, and New York, and 72 miles of gathering line.

Status: Pending FPC approval.

★ Project: About 5½ miles of 8 and 10-in. in Plaquemine Parish, Louisiana.

Status: Under way.

Contractor: **Western Pipe Line, Inc.,** Austin, Tex.

Completion: March 15, 1960.

Project: 21 miles of 16-in. gathering line from Louisiana coast to Block 46 in the Vermilion area.

Status: Pending FPC approval.

Project: 2 miles of 12-in. gathering line from Block 66 to Block 64, East Cameron area, offshore Louisiana.

Status: Pending FPC approval.

Project: 158 miles of 36-in. gas loop at various points between Kinder, La., and Centerville, Tenn.

Status: Approved by FPC.

Project: 41 miles of 30-in. loop east of Hamburg, N. Y.

Status: Pending FPC approval.

Project: 25 miles of 30-in. loop near Kane, Pa.

Status: Pending FPC approval.

Texas Eastern Transmission Corp., Shreveport, La.

Project: 85 miles of 24-in. from Tamarack, to Perulack, Pa.

Status: Pending FPC approval.

Project: 40 miles of 36-in. from Lambertville, to Linden, N. J.

Status: Pending FPC approval.

Project: 23 miles of 20-in. from Eagle, to Chester Junction, Pa.

Status: Pending FPC approval.

Project: 3 miles of 30-in. from Linden, to Staten Island, N. J.

Status: Pending FPC approval.

Project: 65 miles of 30-in. from Perulack, Pa., to Lambertville, N. J.

Status: Pending FPC approval.

Texas Electric Service Co., Fort Worth, Tex.

Project: 200-mile 22 or 24-in. line from Old Ocean field, Brazoria County, Texas, to Fort Worth, and 70-mile 16-in. line from there to Graham, Tex.

Status: Planned.

Transcontinental Gas Pipe Line Corp., Houston, Tex.

Project: 69 miles of 30-in., 211 miles of 36-in., and 7 miles of 16-in. in various states.

Status: Pending FPC approval.

Completion: 1960.

Project: 83 miles of 30-in. and 152 miles of 36-in. in various states.

Contractors: **Williams Brothers Co.,** Tulsa, has contract for 23 miles of 30-in. near DeQuincy, La.; and **Panama-Williams Corp.,** Houston, has contract for 15 miles of 30-in. near Houston.

Status: Under way on 30-in. line.

Completion: 1960.

Project: 13 miles of 24-in. and 40 miles of 8 to 20-in. Louisiana purchase laterals.

Status: Approved by FPC.

Completion: 1960.

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PIPELINE CONSTRUCTION

Transwestern Pipeline Co., Houston.

Project: 490 miles of 24 and 20-in. from Texas to Roswell, N. M., and 670 miles of 30-in. from Roswell to Topock, Ariz., near the California border. Also, 300 miles of 10, 12, and 16-in. lateral lines in Texas and New Mexico.

Status: Under way.

Contractors: **Houston Contracting Co.,** Houston, and **H. C. Price Co.,** Bartlesville, Okla., have joint contract to build the main line. Houston Contracting will build 149 miles of 30-in. from Corona, N. M., west to McCartys, N. M.; 55 miles of 30 and 89 miles of 24-in. from Corona east to Roswell and southeast to Carlsbad; 61 miles of 20 and 76 miles of 24-in. from Fort Stockton, Tex., to Carlsbad; and 166 miles of 24-in. from Roswell northeast to Dawn, Tex. Price will handle two main-line spreads totaling 335 miles in Arizona. As for the 300 miles of laterals, Houston Contracting will carry out this work with **R. H. Fulton & Co.,** Lubbock, Tex., and **Western Pipe Line, Inc.,** Austin, Tex. Western has completed 100 miles of 10, 12, and 16-in. in West Texas and New Mexico.

Completion: June 1960.

Project: 300 miles of 4, 6, and 8-in. gathering lines in the Texas Panhandle, northwestern Oklahoma, Southwest Texas, and southeastern New Mexico. This project is in conjunction with the 1,160-mile Texas-California line (see above).

Contractor: **Sheehan Pipe Line Construction Co., Tulsa.**

Completion: June 1960.

Trunkline Gas Co., Box 1642, Houston, Tex.

★ Project: 252 miles of 30-in. including two loops in Louisiana, one from Mississippi into Tennessee, one from Kentucky into Illinois, and another to the Tuscola, Ill., terminus.

Status: Pending FPC approval.

Completion: Fall 1960.

★ Project: 140 miles of supply lateral in South Louisiana, including a 17-mile 24-in. loop of an existing lateral and 123 miles of 20, 24, and 26-in.

Status: Pending FPC approval.

Completion: Fall 1960.

Project: 24.5 miles of 12-in. gathering line from Lowry, to Cameron Parish shoreline, Louisiana.

Status: Under way.

Contractor: **Sam Carline, Inc.,** Berwick, La.

Project: 42 miles of 24-in. loop from west of Moss Hill, to Silsbee, Tex.

Status: Under way.

Contractor: **Sharman, Allen, Gay & Taylor, Inc.,** Houston.

Project: 53 miles of 30-in. loop from Pitkin, to Pollock, La.

Status: Under way.

Contractor: **Grayco Constructors, Inc.,** Austin, Tex.

Project: 61 miles of 30-in. loop from Pollock, to Riverton, La.

Status: Under way.

Contractor: **APV Co., Inc.**

Project: 177 miles of 30-in. loops in Louisiana, Arkansas, Mississippi, Tennessee, and Kentucky.

Status: Under way.

Contractor: **Panama, Inc., Houston.**

Project: 62 miles of 26-in. extension from Bourbon to Rossville, Ill.

Status: Under way.

Contractor: **Contracting & Material Co.,** Evanston, Ill.

Project: 137 miles of 26-in. extension from Rossville, Ill., to Vistula, Ind.

Status: Under way.

Contractor: **Engineers Limited Pipeline Co.,** San Francisco, Calif.; **Bechtel Corp.,** San Francisco, has the double-jointing contract.

Completion: March 15, 1960.

Canadian Crude Oil Pipelines

Act Oils, Ltd.

Project: A 450-mile line from the Peace River region of northern B. C. to tidewater at Kitimat, B. C.

Status: Proposed.

Bituminous Oil Pipeline Co. (Royalite Oil Co., and Can-Amera Oilsands Development, Ltd.)

Project: A 250-mile line from Athabasca oil sands in northeastern Alberta to Edmonton.

Status: Proposed.

Independent Pipe Line Co. (Home Oil Co.), Calgary.

Project: 1,073 miles of 36-in. from Edmonton, Alta., to Superior, Wis.; 946 miles of 34-in. from Superior to Montreal, Que.; 72 miles of 16-in. and 74 miles of 10-in. feeder lines from Calgary to Bellshill Lake, Alta., on the 36-in. line.

Status: Proposed.

Matador Pipe Line Corp., Denver, Colo.

★ Project: 175-mile line to carry crude from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man., where it would tie in with the Interprovincial pipeline.

Status: Proposed. Representatives of Western Crude Marketers, Inc., Denver, have been conducting feasibility studies in North Dakota. Matador's application is pending before the Canadian Parliament.

Completion: Tentatively early summer 1960.

Mid-Continent Pipe Lines, Ltd., Edmonton, Alta.

Project: 1,500 miles of 30-in. from Edmonton to Chicago, via Saskatchewan, North Dakota, Minnesota, Wisconsin, and Illinois. U. S. section to be owned by International Oil Pipeline Corp., New York City.

Status: Pending Canadian Board of Transport Commission approval. W. C. Gilman & Co., New York City, has made preliminary study.

Peace River Oil Pipe Line Co., Ltd., Calgary, Alta.

Project: 233 miles of 8-in. to move crude from the Milligan Creek area of British Columbia to Trans Mountain Pipe Line in Alberta. The new line will connect with the Peace River system near Valleyview, Alta.

Status: To get under way early in 1960.

Completion: Possibly in the fall 1960.

Project: 8 miles of 6-in., 45 miles of 8-in., and 17 miles of 12-in. from its Fox Creek Pump Station to Windfall, Virginia Hills, and Swan Hills fields in Alberta.

Status: Approved.

Rangeland Pipe Line Co., Calgary.

Project: 111-mile line from Cessford field to Calgary.

Status: Pending approval of Alberta government.

Trans-Prairie Pipelines, Ltd., Edmonton, Alta.

Project: 6-8-in. line from Weyburn field to Regina and Moose Jaw, Sask.

Status: Proposed.

Canadian Products Pipelines

Foothills Products Pipe Line Ltd. (Pembina Pipe Line Co., Mannix Co., Ltd.), Calgary, Alta.

Project: Gathering system to connect Alberta gasoline plants to tunk line from Alberta to Pacific Coast.

Status: Proposed.

Project: A line to carry sulfur, propane, and butane from the Calgary, Alta., area to Milwaukee.

Status: Under study.

Hydrocarbons Pipeline Co., Winnipeg, Man.

Project: 800 miles of 6, 8-in. LPG line from near Edmonton to Fort William, Ont.

Status: Has Parliament of Canada approval. Seeking approval of Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board.

Contractor: **Dutton - Williams Brothers, Ltd., Calgary,** and **A. D. Little Co., Boston,** are consultants.

Pembina Pipe Line, Ltd., Edmonton, Alta.

Project: A 1,200-mile line to carry sulfur, LPG, and natural gasoline from Alberta's gas fields to eastern Canada.

Status: Proposed.

Canadian Natural Gas Pipelines

Alberta Gas Trunk Line Co., Ltd., Calgary.

Project: 256 miles of 36-in., 75 miles of 30-in., 55 miles of 26-in., 199 miles of various diameter gathering lines, and 42 miles of 16-in. delivery lateral. Main line is from Berland River, Alta., to Crows Nest Pass.

Status: Approved by Alberta government. Work to start at the beginning of the 1960 construction season. Line may be in operation by the end of 1961.

Project: 65 miles of 24-in., 10 miles of 12-in., 24 miles of 6-in., and 2 miles of 4-in.

Status: Planned.

Completion: 1960.

Alberta Natural Gas Co., Ltd. (Pacific Gas & Electric Co., San Francisco, and Westcoast Transmission, Calgary).

Project: 108 miles of 36-in. across southeastern British Columbia to U. S. border near Kingsgate, B. C.

Status: Pending approval of Canadian and U. S. regulatory agencies.

British Columbia Electric Co., Vancouver.

Project: 35 miles of 30-in. from Huntington, B. C., to Vancouver.

Completion: 1960.

Cartier Gas Corp. (St. Maurice Gas, Inc. and Consumers' Gas Co., Toronto).

Project: 170 miles from Montreal to Quebec City.

Status: Proposed.

Magna Pipeline Co., Ltd., Nanaimo, Vancouver Island, B. C.

★ Project: 25 miles of 4.85-in. double flexible plastic pipe from Huntington, B. C., to Vancouver Island. It would go under the Straits of Georgia.

Status: Approved by British Columbia Public Utilities Commission. Tentative timetable calls for work to start by spring 1961.

Northern Natural Gas Co., Omaha.

Project: 73 miles of 20-in. from Savanna Creek to Pincher Creek, Alta.

Status: Planned.

Project: 32 miles of 24-in. from Pincher Creek to Montana border to tie in with planned U. S. line on to Minneapolis.

Status: Planned.

Quebec Gas Transmission Lines, Inc., 1610 Sherbrooke St. W., Montreal.

Project: 300-mile line from Montreal to Quebec City.

Status: Proposed.

Trans-Canada Pipe Lines, Ltd., Toronto.

Project: 74 miles of 34-in. main-line loop (Burstall to Winnipeg, Man.) and 51-mile 30-in. lateral from Emerson, Man., to U. S. border near Noyes, Minn., to connect with proposed Midwestern system now before U. S. FPC.

Status: Pending government approval.

Completion: Fall 1960.

Project: An additional 390 miles of 34-in. main-line loop between Burstall and Winnipeg, Man.

Status: Planned. About 268 miles scheduled for construction in 1961, and 122 miles in 1962.

Van Tor Oil & Exploration Co., Vancouver, B. C.

Project: Line from British Columbia

mainland to Vancouver Island.
Status: Proposed.
Westcoast Transmission Co., Ltd., Calgary.
Project: (See Alberta Natural Gas Co., Ltd., for joint project).
Project: 250 miles of 30-in. from Taylor to Fort Nelson, B. C.
Status: Planned.

Foreign Crude Oil Pipelines

Arab Pipeline.
Project: 1,250-mile pipeline from the Persian Gulf to Mediterranean serving fields in Saudi Arabia, Kuwait, Iran, Iraq, and Syria.
Status: Proposed by Saudi Arabian Government as project of Arab countries, and approved by the Arab League's petroleum department.

Arabian American Oil Co., Dhahran, Saudi Arabia and N. Y. C.
Project: 18 miles of 34, 36-in. from Qatif to Ras Tanura.
Status: Planned.
Contractor: Company personnel.
Completion: July 1, 1962.
Project: 6 miles of 30-in. from Ras Tanura to Ras Tanura terminal; 4 miles of 14-in. from Buqqa to QA-2 pipeline.
Status: Planned.
Contractor: Company personnel.
Completion: October 1, 1960.

Barnabos Group (Italian interests).
Project: A line from Venice, Italy, to Innsbruck, Austria, which could then be extended to Munich, Germany.

Basrah Petroleum Co.
Project: 65 miles of 30 and 32-in. from Zubair to Fao in southern Iraq.
Contractor: **Turriff-Burden, Ltd.,** Tulsa.
Completion: 1961.

Bolivia-Paraguay.
Project: 500 miles of 6-in. from Southeast Bolivia to a proposed refinery on Paraguay River, and later to Asuncion.
Status: Planned.

Cie. des Transports par Pipe-lines au Sahara (subsidiary of Cie. de Recherches et d'Exploitation de Petrole au Sahara), Paris.
Project: 420 miles of 24-in. from Edjele fields in Sahara to the Tunisian Mediterranean Coast.
Contractors: **Groupement des Societes Entrepose et Parisienne pour l'Industrie Electrique en vue de l'Etude et de la Construction de Pipe-Lines,** and **Ste. des Grands Travaux de Marseille.** Engineering firm on the job is **Bechtel Mediterraneenne S. A.** (subsidiary of **Bechtel Corp.,** San Francisco).
Completion: October 1960.

Creole Petroleum Corp., Caracas, Venezuela.
Project: About 8 miles of 12, 20, and 24-in. gathering line in Lake Maracaibo.
Status: Planned.
Completion: December 1960.

Eastern Block Council for Mutual Economic Aid.
Project: 2,500-mile "Vomecon" pipeline from the Volga-Ural oil fields in Russia to East Germany, Poland, Czechoslovakia, and Hungary. The system will originate at Kuybyshev on the Volga River and will split into two branches at the Dneiper River, one going to Poland and Germany, the other to Czechoslovakia and Hungary. Expected capacity, 300,000 bbl. daily.
Status: Construction under way in Czechoslovakia, with completion of this section by early 1961.

Elburz Oil Corp.
Project: 1,000 miles of 38-in. to move Qum crude to the Mediterranean.
Status: Under way.

Empresa Nacional de Petroleo, Chilean Government company.
Project: 35-mile 8-in. outlet for fields in the Punta Delgada area of Magallanes Province.
Status: Under way.
Completion: March 1960.

ENI (Italian state oil agency) and Italo-Swiss Finance Co.
Project: A 700-mile system from Genoa to Aigle, Switzerland, thence northeast to the German border, where it would split with one branch going to Munich and another branch to the Karlsruhe area. Feeder lines would go to Turin, Milan, and Cremona, Italy.
Status: The trunk line from Genoa to Aigle has been approved by the Italian Government.

Esso Libya.
★ Project: 100 miles of 30-in. from Zelten field to the Mediterranean Coast.
Status: Pipe ordered. Route and terminal location not yet established.

Iranian Oil Participants, Ltd.
Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bander Mashur line.
Status: Planned.
Project: 99 miles of 26, 28, and 30-in. from Gach Saran field to new terminal at Kharg Island in the Persian Gulf.

Contractor: A joint venture of **Raymond Concrete Pile Co.** and **Williams Bros. Co.,** Tulsa, **Richard Costain, Ltd.,** and **John Brown, Ltd.,** London and **Werkspoor & Bredoro,** The Netherlands.

Project: 20 miles of 30-in. from the Lebanon-Syrian border to Tripoli.

Contractor: **Contracting & Trading Co.,** Beirut, Lebanon.

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PIPELINE CONSTRUCTION

Completion: April 1960.

Project: 250 miles of 30 and 32-in. in northern Iraq from Kirkuk to the Syrian border.

Contractor: **Turriff-Burden, Ltd.,** Tulsa.

Status: Under way.

Completion: 1961.

Israel Government.

Project: 16-in. loop of 8-in. line on 235-mile Gulf of Aqaba-Haifa system.

Status: Proposed.

Project: Replace 125 miles of 8-in. from Elath to Beersheba with 16-in.

Status: Under way.

Completion: Mid-1960.

Kuwait Oil Co., Ltd., Burgan House, 105 Wigmore Street, London W. 1, England.

★Project: 31 miles (balance) of 30-in. North Kuwait transit line.

Completion: March 1960.

★Project: 20 miles of 6-in. Minagish transit line.

Status: Under way.

Completion: May 1960.

Oil India Private Ltd. (Burmah Oil Co. and Assam Oil Co., two-thirds, and India Government one-third).

Project: 720 miles of line in northeast India. This would include 260 miles of 16-in. from Nahorkatiya to Noonmati (site of proposed refinery), and 460 miles of 14-in. from Noonmati to Barauni (site of another proposed refinery).

Status: Contract award expected in February 1960.

Completion: 1962.

Petroleo Brasilerio S. A. (Brazil).

Project: 35 miles of 8 to 12-in. pipe from Buracica to Candeia.

Contractor: **Techint, Inc.,** Milan, Italy.

Project: 80 miles of 24-in. to tie in to proposed Caxias refinery near Rio de Janeiro.

Status: Planned.

Rotterdam-Rhine Pipeline Co. (N. V. Rotterdam-Rijn Pijpleiding Mij., owned 40% by Royal Dutch-Shell, 20% by Caltex, and 40% by Galsenberg & Mobil Oil Sales & Distribution Co.)

Project: 183 miles of 24-in. from Pernis, the port of Rotterdam, extending to Venlo, Holland, where it branches into one line to Wesel and a second to Godorf and Wesseling, Germany. The branch to Wesel connects with a 16-in. line to Gelsenkirchen.

Status: Under way.

Contractors: **Bechtel International Co.** is construction manager of the project which is being constructed by a group of Dutch and German contractors.

Completion: June 5, 1960.

Royal Dutch-Shell.

★ Project: 12-mile line from Gore Bay, Australia, to Royal Dutch-Shell's Clyde refinery.

Status: Planned.

Project: 161 miles 20-in. line from Tandzung field to Balikpapan refinery, Borneo.

Status: Planned.

Contractor: **Williams Brothers Overseas, Ltd.,** Tulsa, and **John Brown, Ltd.,** London.

Completion: January 1, 1962.

South European Pipeline Co. (Jersey Standard, Caltex, Shell, British Petroleum, and 12 other firms.)

Project: 419 mile 30-in. line from Lavers, near Marseille, to Strasbourg, with 40-mile extension to Karlsruhe, Germany.

Status: Construction to get under way by January 1961.

Completion: 1962.

Superior Oil Co., Los Angeles.

Project: A 16 and 24-in. line from its Lake Maracaibo, Venezuela, production to shore.

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PIPELINE CONSTRUCTION

Status: Planned.
Contractor: **Pipe Line Technologists, C.A.**, Maracaibo, has design.

Syrian Pipeline, Damascus.
Project: 500-mile line from Karshuk field, Syria, to Mediterranean.
Status: Proposed.

Union of Soviet Socialist Republic.
Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.
Completion: A 487-mile section from Uyar east to Krasnoyarsk will be completed by the end of 1960.
(See Eastern Block for information on new East Europe line).

Yacimientos Petroliferos Fiscales (Argentina), Buenos Aires.
Project: 390 miles of 14-in. from fields in Neuquen Province, Argentina, to Bahia Blancha on the coast.
Status: Bids requested.
Project: 625 miles of 12-in. from Mendoza to San Lorenzo.
Status: Planned.

Yacimientos Petroliferos Fiscales Bolivianos, La Paz.
Project: 407-mile 12-in. line from Camiri to Sica Sica.
Status: Planned.

Foreign Products Pipelines

Egypt.
Projects: 70 miles from Suez to Cairo and 14 miles from Alexandria to Kafr-el Dawar to carry kerosine, and 68 miles from Alexandria to Tanta to carry fuel oil. Construction of the lines was reported by a West German steel and pipe-manufacturers combine. Pipe order to Phoenix - Rheinrohr - International G.m.b.H. and Mannesmann-Export G.m.-b.H., totaled $15 million.

Esso Petroleum.
Project: 90 - mile 10 - in. line from the 244,400-bbl. Fawley refinery to London.
Status: Under way.

Estrada Ferroviaria Santos a Jundial, Sao Paulo, Brazil.
Project: 25 miles of 6-in. ethylene line from Cubatao to Rio Grande.
Status: Pending approval.
Contractor: **Techint, Inc.,** Milan, Italy.

Kuwait Oil Co., Ltd., Burgan House, 105 Wigmore Street, London W. 1, England.

★ Project: 5½ miles of 12-in. to return product to reservoir.
Status: Planned.
Completion: Summer 1960.

★ Project: About 2½ miles of 8 and 12-in. at Shuwaikh depot.
Status: Under way.
Completion: Summer 1960.

National Iranian Oil Co., Teheran.
Project: 510 miles of 8-in. eastward from Teheran to Meshed, Iran.
Status: Under way.
Contractor: **Williams Brothers,** Tulsa, has contract for about half this project.

North Atlantic Treaty Organization (Bid details from Bureau of Foreign Commerce, U. S. Department of Commerce, Washington).
Project: 57 miles of 8-in. in Germany to Land Baden-Wuerttemberg air field.
Status: Planned.
Project: 93 miles of 6-in. in Turkey.

Petroleos Mexicanos.
Project: 213 miles of 10-in. from Monterrey to Torreon.
Status: Under way.
Contractor: **Inde-Protexa.**
Completion: March 1960.
Project: 291 miles of 8-in. from Torreon to Chihuahua.
Status: Planned.
Completion: March 1961.

Pipelines of Puerto Rico, San Juan.
Project: 95 mile 8-in. line from Commonwealth Oil refinery at Penuelas to Catano in the vicinity of San Juan.
Status: Approved by Puerto Rican Public Service Commission.

Syrian Pipeline.
Project: About 310 miles from a new refinery at Homs to tank farms in the Damascus, Aleppo, and Latakia areas.
Status: Deadline for bids is February 29, 1960.

Union of Soviet Socalist Republic.
Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.
Status: Under way.

Yacimientos Petroliferos Fiscales (Argentina), Buenos Aires.
Project: 652 miles of 10-in. from Lujan de Cuyo to Buenos Aires.
Status: Planned.

Foreign Natural Gas Pipelines

Creole Petroleum Corp., Caracas, Venezuela.
Project: 17 miles of 30-in. and about 5 miles of 16, 20, and 24-in. from Lake Maracaibo flow stations to conservation plant Bachaquero 1.
Status: Planned.
Completion: September 1960.
Project: 22 miles of 12-in. from conservation plant Bachaquero 1 at Lake Maracaibo to conservation plant Tia Juana 2.
Status: Planned.
Completion: June 1960.

Iraq Government.

★ Project: A natural-gas line from Rumaila oil field to Basrah.
Status: Iraq expected to call for bids soon.

Kuwait Oil Co., Ltd., Burgan House, 105 Wigmore Street, London W. 1, England.

★ Project: About 7 miles of 12 and 20-in. in Burgan field.
Status: Under way.
Completion: March 1960.

Mene Grande Oil Co., Caracas, Venezuela.
Project: 19 miles of 12-in. from East Soto to Zapatos.
Completion: 1960.

Pakistan Petroleum Co.
Project: 145 miles of 8-in. high-pressure line from Sylhet field to Daccq, East Pakistan.
Status: Proposed.

Petroleos Mexicanos.
Project: 483 miles of 24-in. from Jose Colomo field in State of Tabasco to Mexico City.
Status: Under way.
Contractors: **Condusa** is contractor. Contracts for eight river crossings on the projects were awarded to **Collins Construction Co.,** Port Lavaca, Tex., and **Constructora Inde S. A. de C. V.,** Mexico City.
Completion: November 1960.
Project: 230 miles of 14-in. from Mexico City to Salamanca.
Status: Planned.
Completion: September 1961.
Project: 291 miles of 12-in. from Torreon to Chihuahua.
Status: Planned.
Completion: March 1961.
Project: 213 miles of 16-in. from Monterrey to Torreon.
Status: Under way.
Contractor: **Inde-Protexa.**
Completion: March 1960.

SN Repal.
Project: 327-miles of 24-in. from Hassi R'Mel gas field in Algeria to the Mediterranean ports of Algiers and Oran.
Status: Construction expected to start soon.

Contractor: **Groupement Entrepose - Ste. Parisienne pour l'Industrie Electrique (GREP)** has contract for 200 miles from Hassi R'Mel to Tiaret.

Standard-Vacuum Oil Co., New York.
Project: 60 miles of 8-in. from Radja field to proposed ammonia plant near Palembang, Sumatra.
Status: Planned.
Completion: Ammonia plant is scheduled for completion in 1962.

Union of Soviet Socialist Republic.

★ Project: A 438-mile line from Dashava to Minsk.
Completion: 1960.

★ Project: A 405-mile line from Saratov to Gorki.
Completion: 1960.
Project: A 465-mile line from Karadag near Baku to Tbilisi and Erevan.
Status: The branch from Karadag to Tbilisi, Georgia, was completed in November 1959. The southern branch to Erevan, Armenia, will be completed in 1960.
Project: A 127-mile line across the Turkmenian Desert from Kizyl-Kum to the Caspian Sea port of Krasnovodsk.
Status: Under way.
Project: Two parallel lines, each over 1,200 miles long, from Gazly, near Bukhara, northward to Sverdlovsk and Chelyabinsk.
Status: Proposed.
Project: Line from Samarkand, through Tashkent to Chimkent, Dzhambul, Frunze, and Alma-Ata near the border.
Completion: Line from Samarkand to Tashkent expected to be finished in 1960. Completion of rest of line expected in 1965.
Project: Line from Sverdlovsk to Omsk, Kemerovo and Tomsk.
Status: Proposed.
Project: Line from Berezovo field to Sverdlovsk.
Status: Proposed.
Project: Line from Stalingrad to Gorky and to Moscow.
Status: Proposed.
Project: Line from Dzhebol field to Izhevsk and to Sverdlovsk.
Status: Proposed.
Project: Line from Gorky to Kaman.
Status: Under way.
Project: Line from Saratov to Sverdlovsk, with branches into Stepanovskoe field.
Status: Proposed.
Project: Line from Kanevskoe (Kraansnedar) field to Sulkhumi.
Status: Proposed.
Project: Line from Shebelinka field to Rostov, to Odessa, and northward to connect with proposed line from Lvov to Leningrad.
Status: Under way.
Project: Line from Riga to proposed line from Lvov to Leningrad.
Status: Proposed.
Project: Line from Rostov to Moscow.
Status: Under way.

Venezuelan Atlantic Transmission Corp., Caracas.
Project: 10 miles of 16-in. loop from La Yaguara to Tacagua Junction.
Contractor: **William Brothers Co.,** Tulsa.
Completion: March 20, 1960.

Yacimientos Petroliferos Fiscales (Argentina), Buenos Aires.
Project: Line from Comodoro Rivadavia to Buenos Aires with a spur to Plaza Huincul field in Neuquen province. Line will be 26-in. to the connecting point for the Plaza Huincul link and 30-in. from the connection to Buenos Aires.

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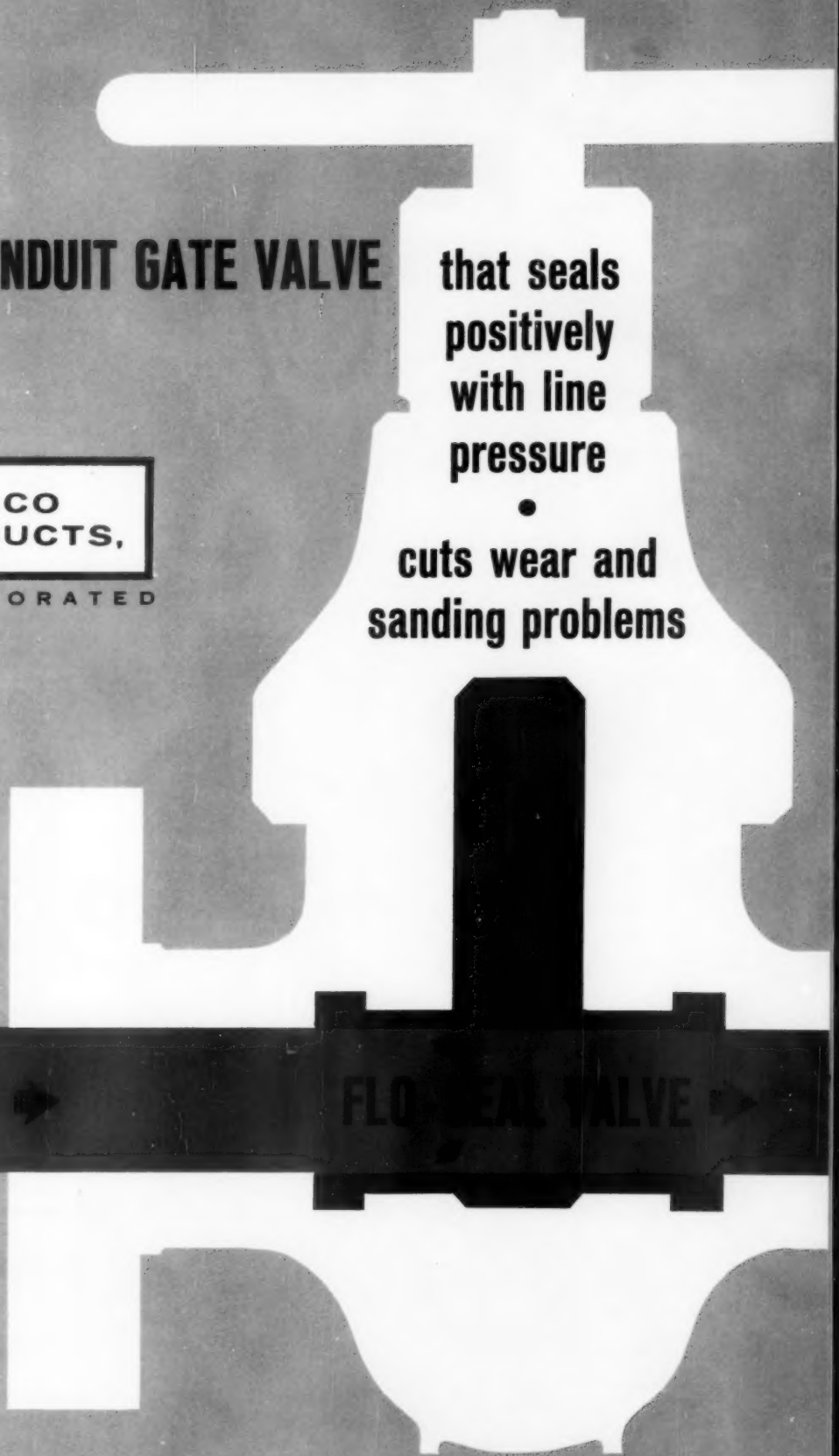

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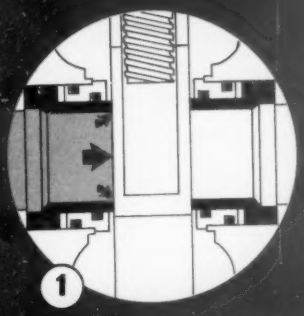

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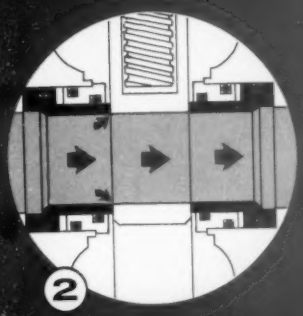

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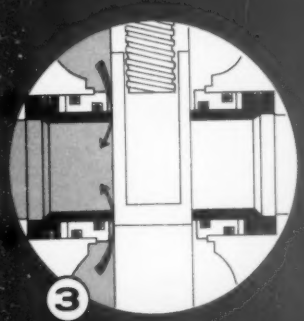

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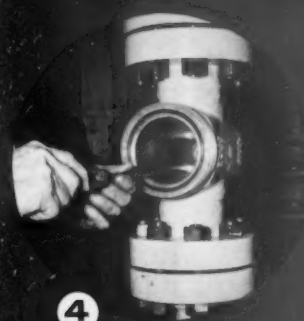

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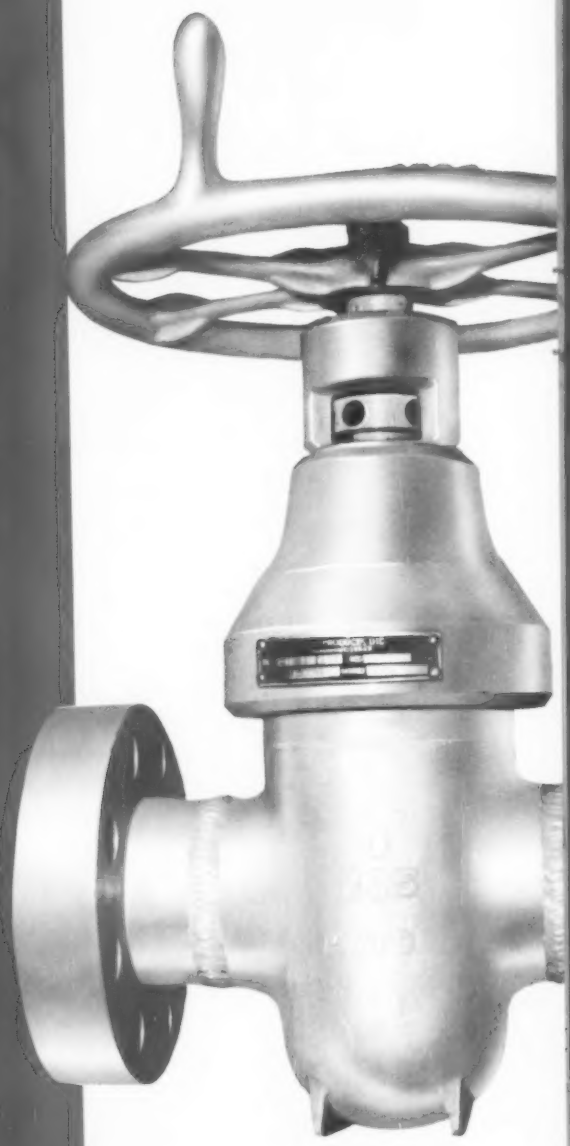
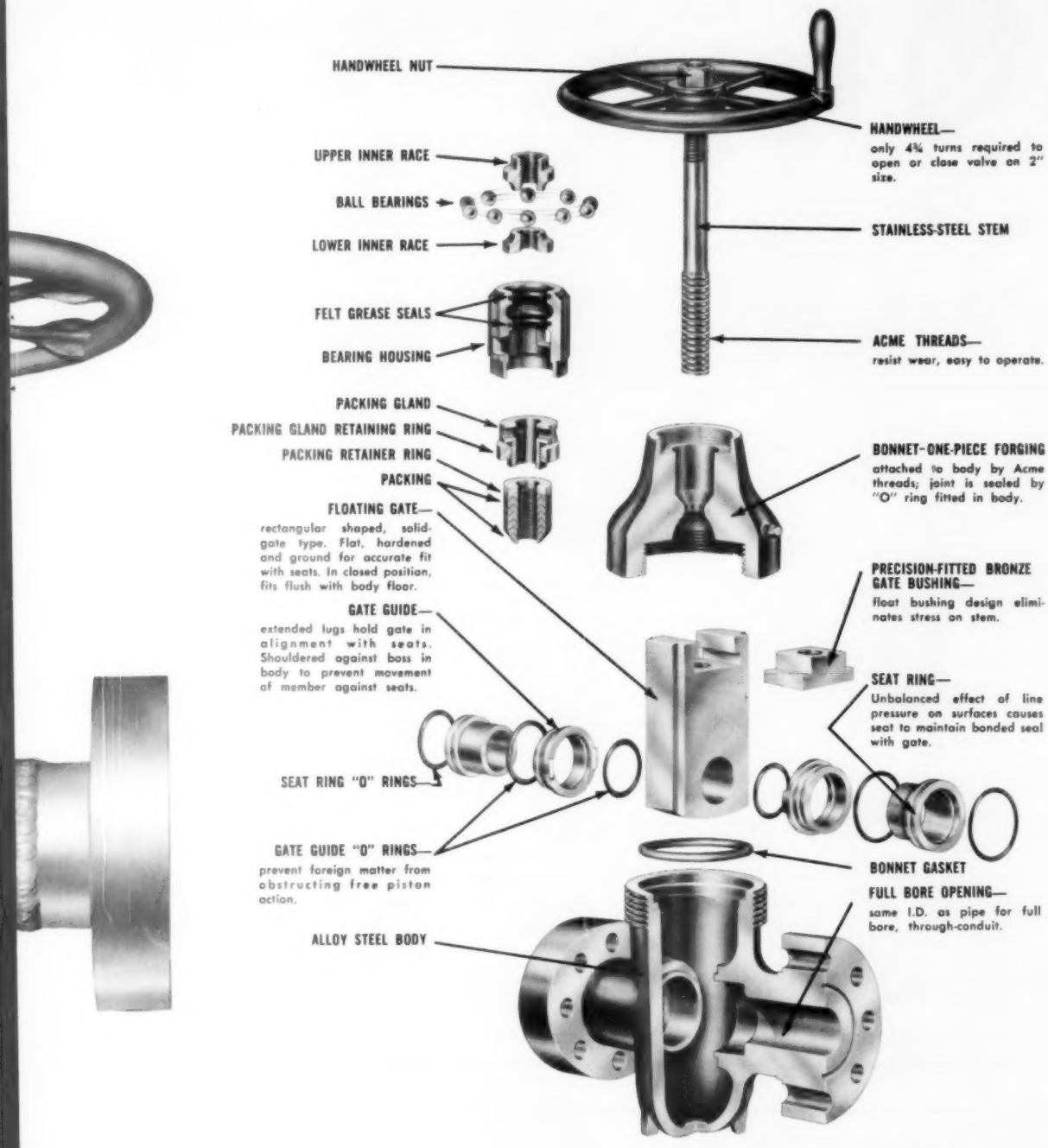


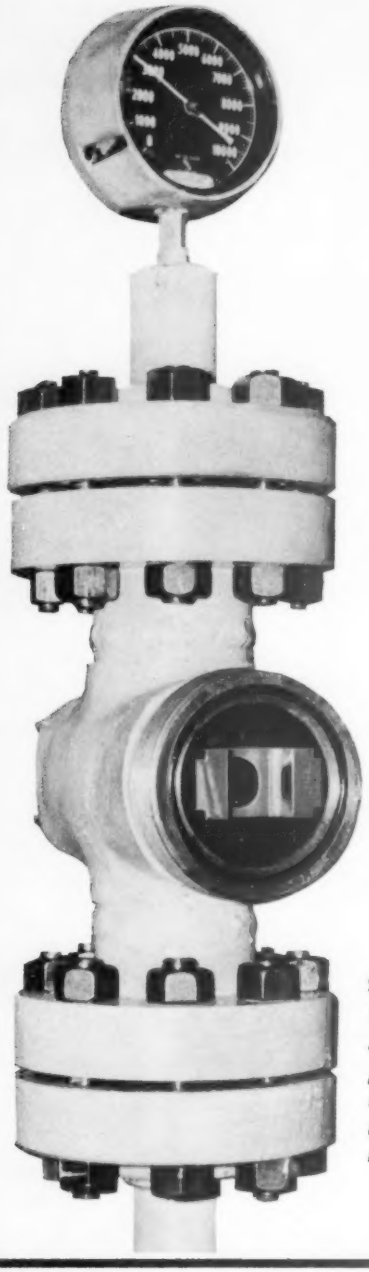
FLO-SEAL VALVE


HANDWHEEL NUT
HANDWHEEL—
only 4¾ turns required to open or close valve on 2" size.
UPPER INNER RACE
BALL BEARINGS
LOWER INNER RACE
STAINLESS-STEEL STEM
FELT GREASE SEALS
BEARING HOUSING
ACME THREADS—
resist wear, easy to operate.
PACKING GLAND
PACKING GLAND RETAINING RING
PACKING RETAINER RING
PACKING
BONNET-ONE-PIECE FORGING
attached to body by Acme threads; joint is sealed by "O" ring fitted in body.
FLOATING GATE—
rectangular shaped, solid-gate type. Flat, hardened and ground for accurate fit with seats. In closed position, fits flush with body floor.
PRECISION-FITTED BRONZE GATE BUSHING—
float bushing design eliminates stress on stem.
GATE GUIDE—
extended lugs hold gate in alignment with seats. Shouldered against boss in body to prevent movement of member against seats.
SEAT RING—
Unbalanced effect of line pressure on surfaces causes seat to maintain bonded seal with gate.
SEAT RING "O" RINGS—
GATE GUIDE "O" RINGS—
prevent foreign matter from obstructing free piston action.
BONNET GASKET
FULL BORE OPENING—
same I.D. as pipe for full bore, through-conduit.
ALLOY STEEL BODY

USES LINE PRESSURE FOR TIGHT SEALING

The new ALCO Products, Inc. FLO-SEAL valve uses pressure in the line to maintain a tight metal-to-metal seal between the floating seats and the gate. Result: as long as pressure is maintained, this valve stays tight.

The FLO-SEAL valve has a full-bore, through-conduit design. There are no restrictions to flow. It can be installed with pressure on either side. It has a non-rising stem, with easy-action ball-bearing stem thrust and packing assembly. The valve is available in lubricated or non-lubricated models.



Flo-Seal Valve Proved in field tests

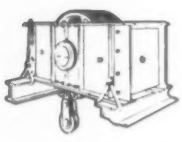
- "In seven-month period . . . valve has been opened and closed approximately 75 times . . . its service as of this date is excellent."
- ". . . valves do not show any sign of wear . . . continue to hold pressure exceptionally well."
- "Field personnel like the valve . . . opening-closing torque. . . ."
- "For 30 days this valve was subjected to all kinds of abrasive drilling mud, emulsions and lost circulation materials, etc. For a period of 15 days valve was opened and closed as much as 5 times a day, operated at 5,200 lb. . . . very pleased with the operation."

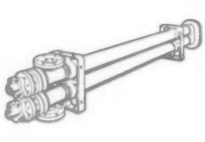
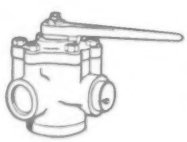
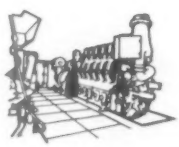
Extensive field tests proved the new FLO-SEAL valve dependable, efficient and easy to operate. As a result of these successful tests, ALCO Products has begun manufacturing the valves in specifications to meet your demands. Available at competitive prices from your supplier.

Recommended for Christmas-tree and flow-line service.

Seals effectively with the bonnet off

This photograph dramatically demonstrates how line pressure effects a positive seal in the FLO-SEAL *gate valve. With a line pressure of 3,000 lb., the bonnet was removed from the valve body. An inspection of the valve revealed that no fluid leaked into the body on either the upstream or downstream side and that the pressure remained constant at 3,000 lb.*



Crown and travelling blocks • Wellhead equipment • Finned tube products • Kinney plug injectors • Diesel electric power package

ALCO PRODUCTS, INCORPORATED

Petroleum Industry Equipment Division
HOUSTON

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

New pumping unit

. . . on market is claimed to be the heaviest pump in its price range. Made in seven models, the unit uses a roller-bearing-equipped gear speed reducer with hardened alloy helical gears and pinions. Typical of the specifications are those for the Model JC-5 unit. Weighing 1,150 lb., it has an adjustable stroke length from 20 to 30 in.

Torque ratings rangs from 10,000 lb.-in. for the smallest up to 16,000 lb.-in. for the largest. Frame settings range from 3,000 to 4,200 lb. Delivery time: immediate. Approximate list price, f.o.b. factory, ranges from $380 to $725. Source: **Cook Mfg. Co., Coffeyville, Kans.**

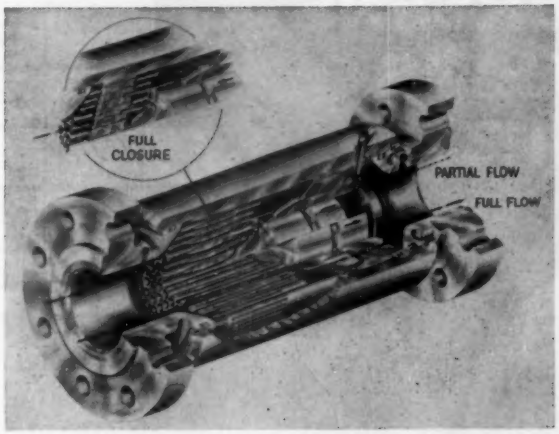
●

Fracturing horsepower

. . . is reduced by a new chemical just announced, according to the manufacturer. The addition agent is said to make it possible to fracture wells where, previously, surface pressures would have exceeded safe limitations of well equipment.

A white powder, the chemical is used to thicken water used in formation-fracturing operations. The maker reports that friction losses caused when small-diameter pipe and tubing are used in well completions are no longer a deterrent to proper hydraulic-fracturing techniques because of properties imparted to the fracturing fluid by the new chemical.

The chemical is easily mixed into the water used for the fracturing medium. It is reportedly nontoxic, easy to handle, and presents no safety problems. Called J-100, the new chemical is now available and has been in actual field use in certain areas for several months. Source: **Dowell Division of Dow Chemical Co., Box 536, Tulsa.**



Valve operates quietly

. . . and promises to virtually do away with aeration, cavitation, surging, vibration, and the resultant noise associated with the rapid flow of fluids, the maker claims. Called a Silent Valve, it is flexible in size and scope and can be obtained in the manufacturer's standard sizes of 1 through 18 in. Larger sizes can also be obtained for special uses.

The main component is a cylindrical plug of elastomer that has a large number of axially aligned holes that serve as flow passages. This plug is contained in a tubular housing between two perforated plates. One plate is either mechanically or hydraulically actuated to compress the elastic insert.

As the plug is compressed, the flow passages are reduced in diameter, thus throttling the fluid flow. At full compression, these channels are closed and complete shutoff is obtained. The large number of small-diameter flow passages permits the energy associated with large pressure drops to be dissipated smoothly by fluid friction within the tiny channels. Both the cylindrical insert plug and the valve body can be made compatible with a variety of fluids, including water and petroleum products.

Delivery time is within 90 days. Approximate net prices, f.o.b. factory, for orders of units of one range from $3,500 for a 4-in. single-cartridge, standard steel-body valve up to $14,700 for the 18-in. single-cartridge, standard steel-body valve. Prices for multicartridge valves and valves with corrosion-resistant properties are slightly higher. Source: **Aerojet-General Corp., Azusa, Calif.**

Want more facts about equipment or copies of product literature described in this issue?

Send this Showcase Coupon

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number: .....

.....

Described in OIL AND GAS **JOURNAL** **- Issue of February 29, 1960**

NAME.....**TITLE**.....

COMPANY.....

ADDRESS.....

CITY.....**STATE**.....

YOU NAME THE MUD SPERSENE THINS IT.....

	Weight—lb./gal.	Viscosity—sec./qt.	Gel Strength—Initial/10 min. lb./100 sq. ft.	Fluid Loss—cc.
Gyp mud	19.0	63	0-3	3.9
Lime mud	12.7	53	0-0	5.0
Saturated salt mud	15.0	64	0-4	2.8
Sea water mud	10.8	40	1-4	7.4

The chart tells the story. Based on mud reports of actual drilling wells, it gives conclusive evidence that Spersene® controls viscosity and gel strength in different types of drilling fluids. The facts prove that Spersene is highly effective in gyp, lime, and salty muds.

Spersene permits the use of high weight gyp muds for deep drilling. The low alkalinity of gyp-Spersene muds improves stability at high temperatures. And, Spersene is soluble in fresh and **salt** water.

Spersene is one more tool developed by Magcobar Technology. The Magcobar mud engineer knows Spersene, knows how to use it right for highest performance. He can help you plan your drilling program with Spersene for maximum economy. So, wherever you drill, begin planning with Magcobar. You'll find that Magcobar Technology combines the finest engineering skills with high performance products to avoid costly trouble in drilling to let you drill at the lowest cost per foot every foot of the way.

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Complete
DRILLING MUD SERVICE

DRESSER INDUSTRIES, INC.
OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

MAGNET COVE BARIUM CORP.
HOUSTON

Well Done
With Magcobar
Technology

80-109

Well completions

. . . of two types can be handled by a new packer now on the market, the maker reports. Called a Type AH packer, it has been designed for use in both conventional and tubingless completions, where small sizes of casing and/or production tubing is used.

The maker recommends it for use in drill-stem testing, tubing testing, single and dual-zone completions, permanent type of completions, hydraulic fracturing, acidizing, and squeezing. The tool has a bottom which, the maker claims, eliminates left-hand rotation of tubing while setting or releasing. The packer has a one-piece mandrel and ring type of packing elements. It is available for 2⅜ and 2⅞-in. o.d. casing, with or without hydraulic holddown slips. Delivery time is a few days. Approximate list price, f.o.b. factory, is $340, complete with holddown for 2⅞-in. casing. Source: **Texas Iron Works, Box 16068, Houston.**

●

Phase converter

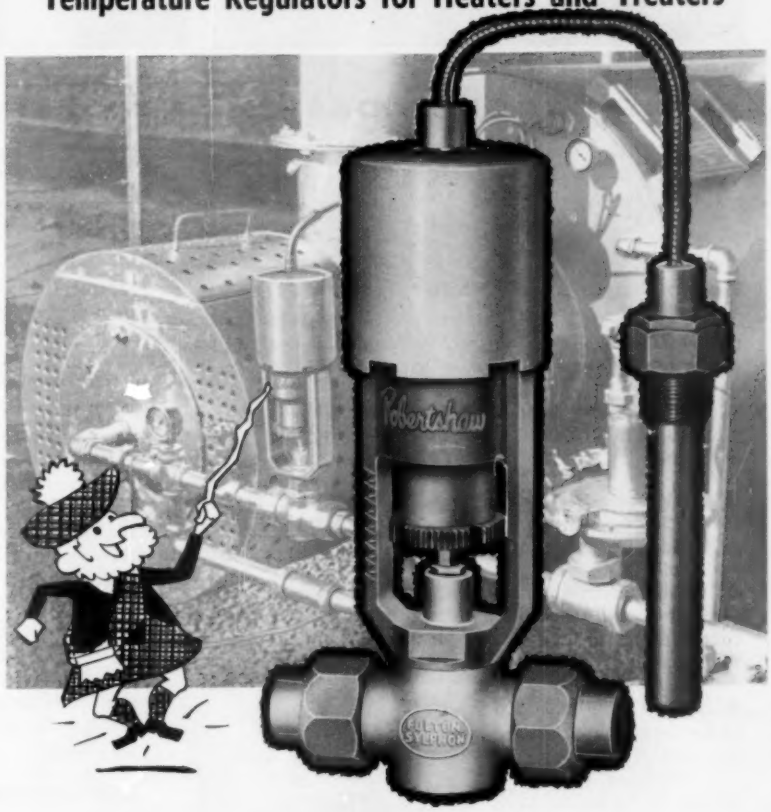
. . . recently put on the market, lets you operate three-phase motors from single-phase power. The new motor-mounted HAS phase-conversion system comes in sizes from 1 to 75 hp. and in the older panel and pole-mounted types for remote installation.

The motor-mounted unit is more compact, lighter, and easier to install, the maker says. Offering complete accessibility, it is raintight with a durable grey finish which, the maker claims, will stand the most extreme weather. Potential uses include oilfield pumping units.

According to the maker, the unit will operate a three-phase motor on varying load with no need for adjustment after installation, and any standard (diamond coils) three-phase 220/440-volt Y-connected motor can be used after minor modification. Source: **Ken Elliott Motors, Inc., P. O. Box 5462, Bossier City, La.**

THE "SCOTSMAN"

Temperature Regulators for Heaters and Treaters



Engineered especially for gas fired heaters and heater-treaters, the rugged, self-powered Scotsman provides positive, low-cost control of emulsion temperature . . . assures full removal of water at lowest possible temperature.

Withstands severe service conditions with little or no maintenance. Single-seated ¾" valve; Buna-N disc for bubble-tight, leak-free closure. Temperature range: 110° to 190° F.

Put the Scotsman to work *now* for greater efficiency, added economy, improved quality of crude going into the line.

For complete specs, ask for Bulletin O-124. **Fulton Sylphon Division, Robertshaw-Fulton Controls Co., Knoxville 1, Tenn.**

Robertshaw

MR. CONTROLS

CONTACTOR NUMBER 1

AMINE PROCESS DESIGN AND OPERATING INFORMATION

Proper use of amines in well designed, correctly operated equipment is essential for efficient gas treating. Some of these important design and operating considerations will be discussed in this series.

Basic Rules for Reboiler Design

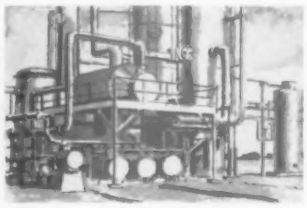
Since the reboiler is the hottest point in a system, maximum efficiency is possible only if these basic design principles are followed:

1. Two or more inlet and outlet nozzles should be employed. This prevents dead flow areas which promote corrosion.

2. Reboilers that operate liquid full are generally superior. They help prevent concentration of higher-boiling corrosive compounds in the reboiler.

3. Tube vibration should be prevented if possible. Condensate should be drained from tubes, long unsupported tube spans eliminated, and teflon inserts used to prevent baffle cutting.

4. Hot oil or direct fired reboilers should be avoided if possible. If they are used, it is mandatory to achieve high circulation rates on the amine side to prevent tube hot spots.



Solution Pressure Reduction

The care used in selecting the proper point for reducing pressure of amine solutions will pay dividends in long equipment life. It is always desirable to maintain pressure on the rich solution until after heat is interchanged with lean amine.

Since high pressure heat exchangers are quite expensive, other methods can be used for reducing point of pressure. For example: use a rich amine flash tank prior to interchange, follow by interchange at about 250-300 psig., and then reduce to still pressure. The flash gas (usable as auxiliary fuel) contains almost all of the dissolved hydrocarbons and little acid gas.

Valves for reducing rich amine solutions are subject to an abnormally high corrosion rate. *Stellite* works well for this service when used in conjunction with high stainless alloy body (316 or better). The valve should have large flow chambers and the inner valve should be as large as practicable.

Fluid Velocities

A fortunate property of ethanolamines is that they are mild corrosion inhibitors. They are also excellent film formers . . . but once formed, the film is not tenacious. An additional measure of corrosion inhibition is obtained in systems absorbing H_2S from a thick FeS layer that passivates the surfaces on which it is formed. High fluid velocities should be avoided at all costs since they destroy these forms of protection.

Avoidance of stream impingement onto tubes in heat exchangers is especially critical in rich amine streams.

Because diaphragm control valves are expensive, small valves are sometimes employed for solution pressure letdowns by swaging the line to fit them. This basically is *not* good practice, since valve and swage corrosion generally occur.

Minimizing Stress Corrosion Cracking

Since ethanolamines are likely to cause stress corrosion cracking, vessels and piping should be stress relieved after fabrication and welding on oil equipment. Care should be taken in erection of stress relieved equipment to prevent setting up mechanical or heat stresses.

Cases have been reported where columns had to be replaced after only 2-3 years operation because of stress corrosion cracking. In addition to stress relieving, stress corrosion cracking can be minimized by controlling process conditions, since cracking occurs only in a corrosive environment.

FOR MORE INFORMATION, look for future issues of Allied Chemical Contactor featuring articles on ethanolamines and glycols in gas treating operations.

We will gladly send technical data, delivery and price information on Allied Chemical Ethanolamines and Ethylene Glycols.

For specifications and local offices, see our insert in Chemical Materials Catalog, pages 475-482 and in Chemical Week Buyers Guide, pages 37-44.

BASIC TO AMERICA'S PROGRESS

Allied Chemical

NITROGEN DIVISION

Dept. C1-55-1, 40 Rector Street • New York 6, New York

2819

Compactness stressed

. . . in new valve recently put on the market for pipeline and manifolding service. Called a G-5, the valve is more compact than most older types and comes in both lever-operated and hand-wheel-operated models in sizes from 2 to 36 in. The lever-operated version is quick opening, and the hand-wheel model is equipped with double acme threads for fast operation. An advantage cited for the valve for block and bleed service is that the valve provides a seal on the upstream and downstream sides of the gate. It thus offers a way to cut hookup costs by eliminating one valve and a spool normally required in such assemblies. The valve has a bleeder plug that permits venting of the body cavity with the valve in the closed position.

Strong springs hold the valve's two metal seat rings against the body side plates. The valve promises to prove valuable for use with meter runs, separator lines, tank batteries, meter manifolds, tank runs, and other general pipeline uses. The valve is available in ASA 150 Series. Delivery: 2 to 6 weeks. Source: **Grove Valve & Regulator Co., 6529 Hollis Street, Oakland, Calif.**

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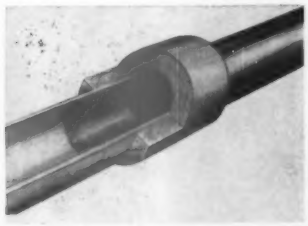

Pipe coupled

. . . in the field fast with a new permanent pipe coupling, called a Thermocoupling, now available. Actually, it is a thermite-weld process connection which can be completed in a few minutes on ¾ to 1½-in. pipe. No external source of power is required, making the method particularly valuable in the field.

The actual Thermocoupling is a fusion weld which, the maker says, is permanent and cannot be loosened by vibration. The coupling becomes an integral part of the pipe by fusing to it. It requires no bolting, threading, or cutting.

6 REASONS WHY JOHNSTON VERTICAL HIGH PRESSURE PUMPS HAVE BECOME SO POPULAR

Many uses: as suction boosters, in power plants, pipe lines, refineries, for bulk plant transfer, in municipal booster service.

1. SPACE SAVING – You get 3 times the capacity in ⅓ the space, with vertical Johnstons.

2. LESS DOWN TIME – Johnston verticals are designed for trouble-free operation with long-life expectancy.

3. LONG BEARING LIFE – In vertical Johnstons, thrust is taken up in the motor bearings, not in the pump, eliminating a frequent trouble source.

4. NON-OVERLOADING – Johnston high-pressure verticals have both a flat horsepower curve and steep head-capacity characteristic, making for economy and safe operation. With a Johnston, there is no danger of an overload.

5. EASY CONNECTIONS – It's easier to make piping connections with a Johnston vertical.

6. GREATER EFFICIENCY – Johnston's accommodate variations in head by staging, as well as by trimming the impellers, thus giving much greater efficiency over a vastly wider range.

Pressures over 1,000 psi.
Capacities to 12,000 gpm
Temperatures to 600°F.

For complete details talk to your nearest Johnston distributor or write direct to the factory for colorful "Type C Industrial Pump" bulletin.

Versatile Verticals by...

JOHNSTON PUMP COMPANY

A DIVISION OF THE YOUNGSTOWN SHEET AND TUBE COMPANY

3272 E. Foothill Blvd., Pasadena, Calif.

SHOWCASE . . .

New Equipment

The coupling of pipe is accomplished by making use of the high temperature of the reaction between powdered oxide and aluminum. The reaction takes place in a graphite mold. When the powder is ignited in the mold, it turns to superheated liquid metal which, when cooled, forms a fusion weld coupling of the pipe.

The technique of coupling pipe promises to save on welding costs as it is simple to install and can be used in the field by personnel without welding training. Approximate price, f.o.b. factory, ranges from $1.95 for a ¾-in. to $2.45 for a 1¼-in. weld in quantity. Source: **Continental Industries, Inc., 7406 East Forty-first, Tulsa.**

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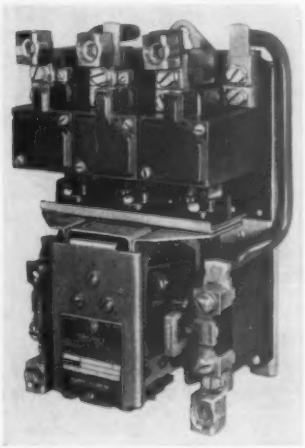
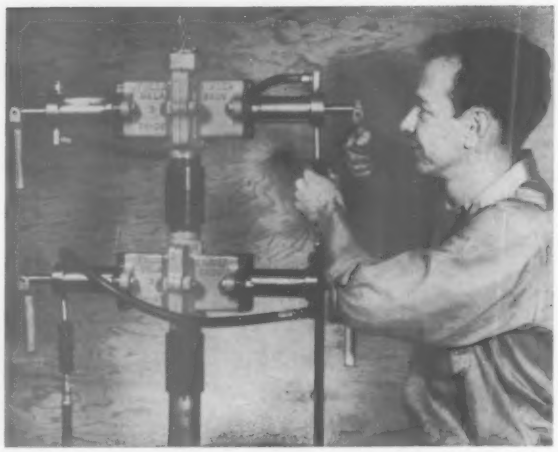


Motor starter

. . . is more compact than older designs. According to the manufacturer, the new NEMA Size 4 starter is 33% smaller yet it retains the long-life electrical and mechanical characteristics of the previous design. It measures 12⅜ by 8; by 6 5/32 in.

Features of the starter include trip-free melting-alloy overload relays with unit-construction thermal units, or adjustable bimetallic overload relays with hand and automatic reset. Up to four double-circuit interlocks may be added.

Other features include molded coils plus contact blocks molded of inorganic, noncarbon tracking material and large contact tips of silver alloy that contribute to long life and easy inspection and maintenance. Delivery: immediate. Approximate list price, f.o.b. factory, ranges from $266 for open devices up to from $308 to $563 for enclosed devices, depending upon enclosure type. Source: **Square D Co., 4041 North Richards, Milwaukee 12.**



Immediate manual takeover

. . . in the event of hydraulic failure is provided by a newly developed hydraulic oil saver. The equipment can be operated by hand without any adjustment or shutdown while the failure is corrected, the maker reports.

The oil saver uses a large piston area to operate at low pressure. The handles of the hydraulic cylinders act as gages to indicate when a change of packing rubbers is needed. The hydraulic package, the maker says, is applicable to present conventional oil savers with minor installation requirements.

The complete hydraulic oil saver as well as the hydraulic application itself is available in both sand-line and drilling-line types, for single-head, single-pump, and double-head, double-pump use.

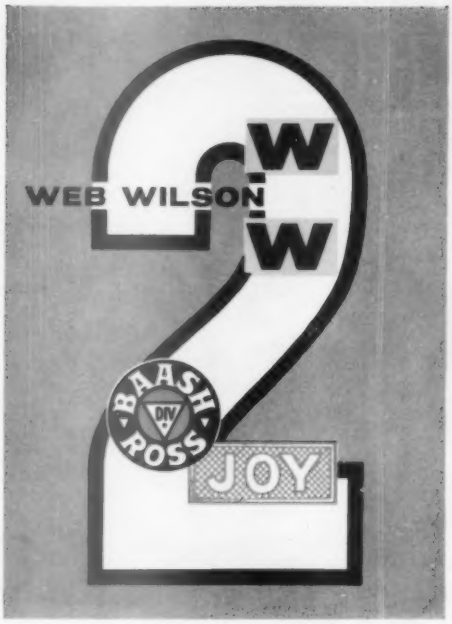
Noteworthy features of the hydraulic equipment include: (1) corrosion-resistant nichrome automatic return spring, (2) oil-resistant wiper seal to prevent salt-water entry into the cylinder, (3) oil-resistant pressure seal with Teflon backup rings, and (4) a positive stop to prevent overtravel of the ram under all operating conditions. Source: **Skinner Brothers Co., P. O. Box 13556, Dallas.**

Chemical-spray washing system

. . . for use on oil-field equipment has been announced that permits the use of heated chemical spray under high pressure to cut grease and oil deposits from such equipment as drilling rigs, pulling units, pumping units, tank batteries, and other stationary equipment. It can also be useful to clean such rolling stock as transports and field cars.

The Thermadraulic system is basically an instant heater combined with a 100-gal. chemical tank and a high-pressure pump. Suited for use in the field or shop, the unit is portable. For field use, it is propane-fired and mounted on an I-beam skid. For shop use, it is natural-gas fired.

Available with a nozzle pressure of either 200 or 300 psi., the unit comes with 100 ft. of hose rated at 5,000-psi. burst pressure. Delivery time: 2 weeks. Approximate list price, f.o.b. factory, ranges from $795 for the ENS-200 shop unit up to $950 for the GPP-200 field unit. Source: **Sprayaway Corp. of America, Box 1102, Tulsa.**



Great Lines Become 1 Better

Web Wilson Now A Part of The Baash-Ross Division of Joy Manufacturing Company

Joined with the well known line of Baash-Ross products is the Web Wilson line of hooks, elevators and links, tongs, and other products, for one better line of equipment to serve the drilling industry.

With even better service, quicker delivery, and one manufacturer responsibility, customers using Baash-Ross—Web Wilson products will realize more fully the advantages of this equipment.

Specify with confidence Baash-Ross—Web Wilson Tools . . . your assurance of quality and continuing service.

ENTERING OUR 41ST YEAR OF PROGRESS

BAASH ROSS DIV JOY

EXTENSIVE RENTAL AND SERVICE FACILITIES ARE AVAILABLE IN MOST OIL FIELD AREAS . . . CALL US.

BAASH-ROSS DIVISION
OF JOY MANUFACTURING COMPANY
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Not only is the Mission Valve always ready to seal, but the **higher the** pressure the tighter the seal. Line pressure forces Mission sealant **through two** semi-circular grooves around the downstream port, sealing like a **plastic packing**, to form a gas tight seal. Leaks are stopped *automatically* before **they start.** **The complete line** of 315 Mission Valves brings the positive advantages of easy opening and tight sealing to practically all valve applications. **This wide selection,** the Mission Guarantee, and the Mission Renewal Policy combine **to make** Mission Valves your best buy. Specify Mission and eliminate your valve **problems.**

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SHOWCASE . . .

New Literature

Rotameters

. . . that transmit pneumatically, designated SK Model 58, are detailed in Bulletin 18N, yours for the asking. According to the literature, these instruments transmit an air signal proportional to fluid rates of flow to remote-located indicators, recorders, controllers, or integrators.

The transmitters are designed for use with either glass-tube or metal-tube rotameters. They are mounted directly on and are magnetically coupled to the rotameter to sense the rotameter-measured fluid rate of flow. The four-page bulletin includes photos, sectional drawings, and information on materials of construction, operation, and application.

Characteristics of the transmitter unit, dimensions, and maximum capacity ranges are also included. Source: **Instrument Div., Schutte & Koerting Co., Cornwells Heights, Bucks County, Pennsylvania.**

Formation fracturing

. . . by sonic energy can be accomplished by a new method—Stereo-Frac—as described in an available bulletin. The process uses high-intensity sound waves, produced by firing a Stereo-Frac gun, to fracture a producing formation. After the fracture is made, it can be extended by conventional hydraulic means.

The bulletin includes a schematic diagram of the jet-charge arrangement, and photographs of targets that were fractured by the process. A table shows results of Stereo-Frac field tests in the Clinton sand in North Central Ohio. Source: **Oil Tool Engineering Corp., Meadows Building, Dallas.**

Pumps

. . . and proportioning units for multiple-purpose uses are outlined in obtainable 8-page Bulletin 600. It lists four basic types of Vari-Flo pumps which can be fitted to a wide range of services. The literature offers operational data, equipment features, methods of selecting pumps, application table, and viscosity-g.p.m. curves. Source: **Blackmer Pump Co., Grand Rapids 9, Mich.**

Electrode

. . . guide just issued contains information on all types of electrodes available from Airco: mild steel, low alloy, low hydrogen, iron powder, stainless steel, hardfacing, nonferrous, and cast iron. Under each electrode listed, the 64-page guide contains a brief description together with applications, procedures, and pertinent AWS-ASTM data.

Two 8-page foldouts at the rear of Form 650 offer charts of recommended electrodes for welding ASTM and tradename steels, and comparison tables for mild steel and hardfacing electrodes of several manufacturers. Source: **Air Reduction Sales Co., Div. of Air Reduction Co., Inc., 150 East Forty-second Street, New York 17.**

Oil and chemical

. . . equipment manufactured by a West German company is described in a new publication now available. The 28-page booklet contains various sections which deal with pipe, steel materials, pipeline construction, power generation, steam and diesel engines, refineries, propane-gas equipment, refractory bricks, and plastic pipe and products. Department code letters are given for obtaining more details on specific products. Source: **Mannesmann-Export G.m.b.H., P. O. Box 6007, Dusseldorf, Germany.**

Shipping solution

. . . is related to a procurement problem in a new brochure. Obtainable for the asking, the publication—Operation Procurement—tells how a landing craft carried four assembled 100-ton diesel engines from a U. S. port to a Venezuelan refinery, where the engines were promptly installed.

When the landing craft beached near the refinery, the engines were hauled to their foundations only 1,000 yards away by a heavy-duty truck and lowboy which came on the deck of the vessel.

Shipping the engines fully assembled avoided extra expenditures, primarily the costs and time involved if reassembly of engine components at the construction site had become necessary. Source: **M. W. Kellogg Co., 711 Third Avenue, New York 17.**

Welding accessories

. . . are featured in new 16-page arc-welding supply Catalog EW-211 available now. It gives information on headshields, grinding shields, goggles, cleaning tools, electrode holders, cable connectors, ground clamps, work-holding clamps, welding cable, protecting clothing, welding gloves, and miscellaneous equipment. Source: **Hobart Brothers Co., Troy, Ohio.**

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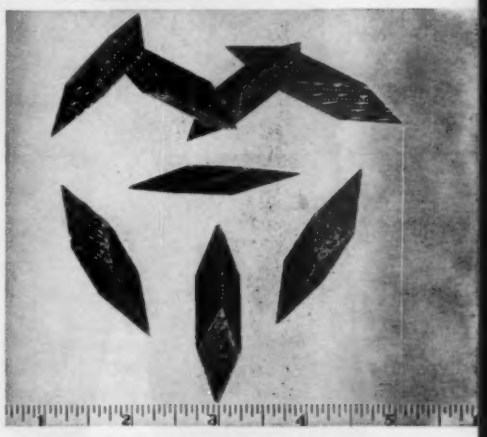
IN BAD LOST CIRCULATION AREAS YOU HAVE 100% BETTER CHANCE OF GETTING RETURNS WHEN YOU USE MASTERPLUG*



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MASTERPLUG* is a pointed wedge shaped plug designed specifically to establish an initial bridge in large fractures. Added to any sealer it will greatly increase its bridging ability. It mixes easily in the suction pit and pumps without difficulty or damage to mud pumps. Reasonably priced. Masterplug is currently being used in Canada, the Rockies, Texas and Oklahoma with outstanding success.

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Will success spoil the 53P controller?

Success due to luck may spoil . . . but the 53P has *earned* its recognition over the years with a combination of advantages offered by no other pneumatic controller. Standardized design for top level performance has won the 53P an honored place in the process loop . . . behind the panels, in the instruments, and along the catwalks of the country's most progressive plants.

The only standardized controller

One basic 53P accepts pneumatic or mechanical inputs. You get the same performance whether you mount it in a large case instrument, plug it onto a miniature recorder, or field mount it. The same controller permits everything from proportional to three-mode control . . . and the new "universal" offers 2 to 50% proportional and 2 to 100% differential gap action in the same units!

The only regenerative feedback controller

Only the 53P incorporates the F&P principle of regenerative feedback to give you improved linearity and increased gain. A non-bleed type amplifying relay assures low air consumption (.08 scfm, steady state). No other controller offers all these features or equals the static and dynamic performance characteristics built into the 53P. You'll find any number of reasons for the success of the 53P controller in Catalog 53P-4000. Write for your copy, or call the F&P field engineer nearest you. Fischer & Porter Company, 3120 County Line Road, Warminster, Pa. In Canada, Fischer & Porter (Canada) Ltd., 2700 Jane St., Downsview, Ont.

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▶▶▶ Equipment Men Notes

William S. Lennard is manager

. . . of drilling-equipment sales in Los Angeles for U. S. Steel Corp.'s Oil Well Supply Division, according to D. S. Grubbs, the division's California area manager. Lennard was employed by Oilwell in 1948 at Los Angeles.

He was transferred to Long Beach in 1950 and appointed assistant district engineer, returning to Los Angeles in 1953 as assistant to the area engineer. Lennard became Los Angeles city representative 5 years ago and held this position until the present.

Board elects A. William Fraser

. . . vice president and general sales manager of Worthington Corp. He was formerly general marketing manager.

Fraser joined the Harrison, N. J. concern in 1929 as a sales engineer. He was district office manager in Chicago from 1937 to 1945 when he went to Paris as general European manager. He returned to Chicago in 1951 as midwest regional sales manager, where he remained until being appointed general marketing manager in 1957.

J&L Supply Division makes

T. W. Small

. . . eight new assignments in its field-sales organization, announces W. L. Wolfe, vice president of sales. T. W. Small has been appointed sales manager of the West Texas district with headquarters at Odessa. He is moving from East Texas where he was a Jones & Laughlin salesman.

Other assignments involve: B. G. O'Brien, new salesman at the Harvey, La. store; M. D. Hartsell, resident salesman at Jackson, Miss.; R. R. Angerstein, assigned to the Wichita sales office; B. E. Irby, salesman at the Longview, Tex. store; J. M. Harp, salesman at the Shreveport store; K. M. Snipes, salesman at Kermit, Tex.; and D. Loyd, salesman at Snyder, Tex.

BOWEN ITCO'S ADDITIONAL PROPERTY following the acquisition of Kinzbach Tool Co., is shown in this aerial photo. Solid white lines indicate Bowen Itco's original property, and broken white lines indicate land and facilities of Kinzbach obtained in the purchase. The acquisition upped Bowen Itco's 114,250-sq. ft. of property in Houston to a total of 164,250 sq. ft. Kinzbach's line of oil-field tools —namely whipstocks, mills, casing mills, stuffing boxes, tubing spiders, and relief valves—is expected to fill in and complement Bowen Itco's specialty tools for the fishing, drilling, production, and wire-line phases of the industry.

George A. Peck named president

. . . of Southwestern Industrial Electronics Co., of Houston, one of the Dresser Industries, replacing Keith R. Beeman. Peck comes to S.I.E. from Stromberg-Carlson Co., Rochester, N. Y., where he was vice president and general manager of the Electronics Division.

Beeman was co-founder of the company and its president since S.I.E. was founded in 1945. He is accepting a new position with the parent Dresser company, in which he will be engaged primarily in the investigation of new product possibilities. He will continue to locate in Houston.

Schlumberger reports changes

. . . in field personnel assignments. D. E. Roth, who formerly served as a field engineer general at Lubbock, Tex., has been named sales engineer for that location. T. E. Lovan, field engineer general at Evansville, Ind., has been moved to Schlumberger Well Surveying Corp.'s northeast division as a sales engineer.

National Supply Co. sells

. . . its T-45 550-hp. completely portable drilling rig to International Drilling Co., of The Hague, The Netherlands, for use in Libya. The big, powerful rig was designed for speedy transportation in desert areas.

The T-45 features a mud tank and a substructure that can be operated as trailers. Both units are equipped with wheels to permit them to be hauled like semi-trailers. However, they may be removed quickly, so that the units rest firmly on the ground for drilling. Other rig components are carried on 4 semi-trailers. All wheels are equipped with extra-size desert-type tires. The rig is normally considered for drilling in the 4,500 to 7,500-ft. depth range.

John W. Borror is promoted

J. W. Borror

. . . to assistant sales manager at Herb J. Hawthorne, Inc., reports W. A. (Bill) Davidson, sales manager of the Houston manufacturer of exploration drill bits.

After graduation from West Virginia University in 1935, Borror started with with Gypsy Division of Gulf Oil Corp., handling various production and drilling assignments. He later joined Sohio Petroleum Co. and served as district engineer, unit engineer, staff mechanical engineer on Sohio's central engineering staff, district superintendent, and staff engineer in Sohio's southern division office.

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(1) How to get into oil and gas investments; how investment opportunities develop and how to share in them; acquiring interests; joint operations; development, operation, and payment to investors, etc.

(2) How taxes reduce the risk; tax plans which produce maximum net-after-tax returns; family tax plans; organizing oil and gas ventures; assuring your retirement through oil.

(3) Actual case-histories of oil and gas investments and the potential payoffs (with these to guide you, you can readily decide the best money-making strategy).

Why miss out on the benefits of this tremendous field? Send today for a free examination copy. Keep it for two weeks, then return it without obligation, or keep it and send only $12.50 plus shipping charges in full payment. (Save shipping charges by remitting $12.50 now—same refund privilege.) Write today to Dept. OG-12, Business Reports, Inc., Larchmont, New York.

Joe B. Henderson, Jr. is named

J. B. Henderson

. . . application engineer, announces E. J. Lell, vice president in charge of Colmonoy Division, Wall Colmonoy Corp., Detroit producer of hard-surfacing alloys and related application equipment. In his new post, Henderson will work out of the corporation's Houston district office as a petroleum-industry specialist under the direction of H. L. Howard, vice president in charge of southwest regional operations. Prior to joining Wall Colmonoy, Henderson was a sales engineer with Macco Oil Tools, Inc.

David James is sales engineer

. . . with the Dallas office of Cooper-Bessemer Corp., Mount Vernon, Ohio, according to George Edick, manager of domestic sales. James was previously assigned to the C-B home office in a sales-engineering capacity. Before joining the company he was with Ethyl Corp. and The Texas Co.

William B. Adair becomes

W. B. Adair

. . . assistant vice president and division manager of Maloney - Crawford Tank & Mfg. Co., with offices in Houston. In his new post, he will direct the activities of company personnel in Texas, Louisiana, Mississippi, and Alabama Gulf Coast regions. He also will be on the staff of Willard H. Land, vice president and sales manager.

Prior to joining Maloney-Crawford, Adair was assistant vice president of Macco Oil Tool Co., in Houston. He has also been employed by Associated Engineers and by Parkersburg Rig & Reel Co.

M. K. Nolan is appointed

. . . sales representative in Houston to handle sales and engineering of oilfield and heat-transfer equipment in Texas and Louisiana for Young Radiator Co., of Racine, Wis., and Mattoon, Ill. Nolan was formerly with J. R. Meek Co., Houston.

Western Co. assigns Dee Jones

. . . to a division sales-representative post in Tulsa, according to C. E. Wooldridge, Oklahoma City division manager for the oil-well-servicing company.

Jones, former sales engineer in Western's Seminole, Okla. district, has been with the company since 1956. He was sales engineer and later sales supervisor in the company's Borger, Tex. district, prior to going to Seminole more than a year ago.

A. Russell Young takes over

. . . as assistant executive vice president and general manager of J. F. Pritchard & Co. Six years after joining the Pritchard organization as an engineer in 1938, he became manager of the Gas Division. He was appointed vice president of the company in charge of the Gas Division in 1954. Young is also vice president of Constock - Pritchard Liquefaction Corp., with headquarters in New York City.

Oil Well Supply Division names

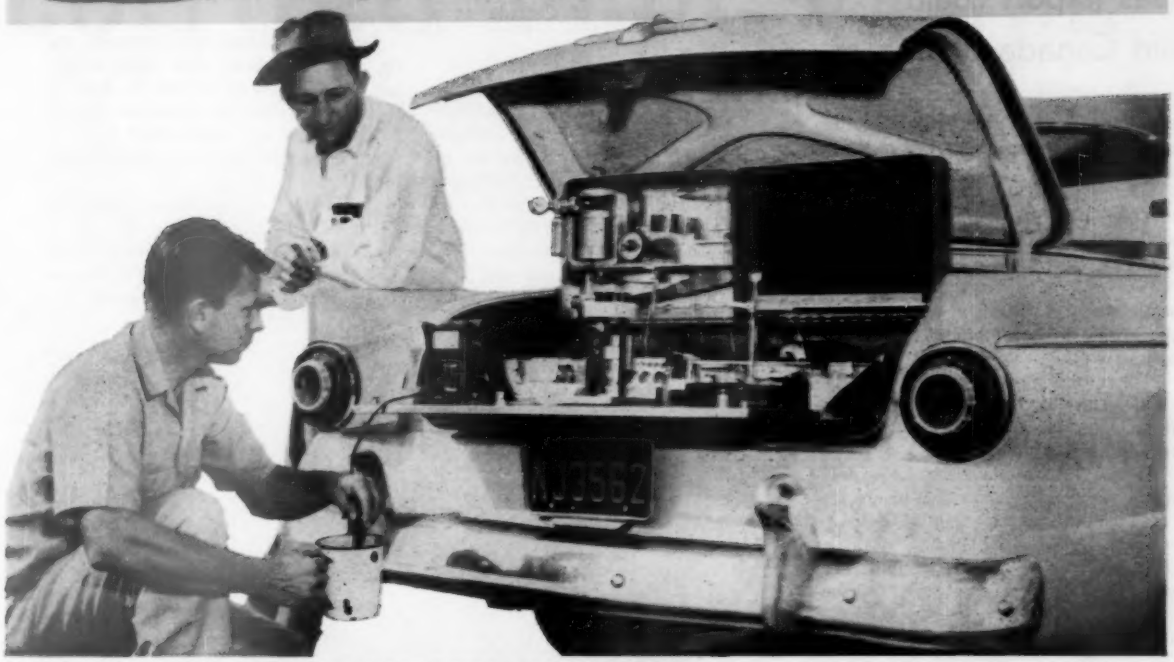
. . . three to new posts. William H. Harris is a newly appointed field representative at Morgan City, La. N. L. Cain takes over as field representative at Williston, N. D. and Dewey A. Bond becomes manager at the division's Borger, Tex. store.

George D. Wick III is named

. . . assistant manager of standard pipe sales for Youngstown Sheet & Tube Co., M. H. Watkins, vice president of sales, announces. Now located in Charlotte, N. C. as a resident salesman in the Atlanta district, Wick will return to the general offices in Youngstown. The new assistant manager joined the company as a time-study man in 1947. He was named a student salesman in 1949 and was assigned to the Youngstown sales district. Wick transferred to Charlotte in 1952.

In this section of the February 8 issue, The Oil and Gas Journal incorrectly referred to Garrett Oil Tools, Inc., as being a division of Dresser. This, of course, should have reported that Garrett is a division of U. S. Industries, Inc. The story dealt with Garrett's new appointments of D. E. Whittenberg, R. E. Dunn, and J. T. Conner.

You save drilling dollars with a Baroid Mud Program



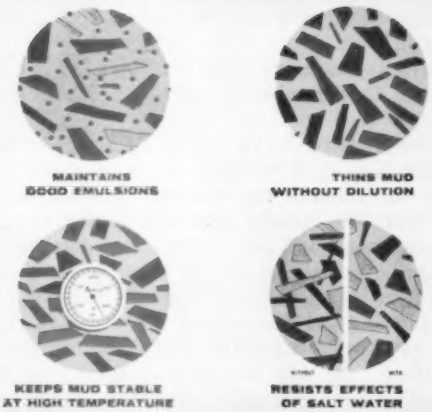
THE MUD PROBLEM AND ITS SOLUTION

CARBONOX*

When the mud problem is to control drilling mud flow properties, CARBONOX is the answer. An organic mud thinner used for more than 12 years in all areas at all depths, CARBONOX is economical, simple to use and reliable in results.

In a typical case history where CARBONOX was part of an over-all Baroid mud program, CARBONOX proved to be the best thinner for controlling high temperature gelation and viscosity and aided in controlling filtration and filter cake thickness. This was on a 16,684 foot well in San Salvador Field, Hidalgo County, Texas. Bottom hole temperature was 356°F, mud weight was up to 19.1 lb/gal, and other adverse conditions included salt contamination and lost circulation. Yet CARBONOX helped keep the lime-treated oil emulsion mud in desired condition.

CARBONOX is a Baroid original, developed to control mud flow properties economically. Baroid develops complete mud programs to solve your specific drilling mud problems and save *your* drilling dollars.


MAINTAINS GOOD EMULSIONS
THINS MUD WITHOUT DILUTION
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RESISTS EFFECTS OF SALT WATER

BAROID

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6029

Gas export could aid Canada drilling

ACCORDING TO S. W. Shambaugh, president of the Canadian Association of Oilwell Drilling Contractors, "The drilling industry of Canada could provide direct and indirect employment for 10,000 people if drilling programs were provided to utilize the industry's idle rigs. Approval for additional export of natural gas from Canada would stimulate the industry and increase the tempo in development and exploration drilling."

These views were expressed in a recent letter to the National Energy Board, and he urged that the export of natural gas be approved.

During the past few years, the drilling industry has suffered a heavy setback as a result of minimal development drilling caused by a lack of markets for petroleum and natural gas. His letter added, in part, "We believe that prompt action to facilitate the export of gas to those markets which are now available will be of great assistance to our industry. This improvement would reflect in benefits for the entire petroleum industry, and assist the economy of Canada as a whole."

Offshore workover rig

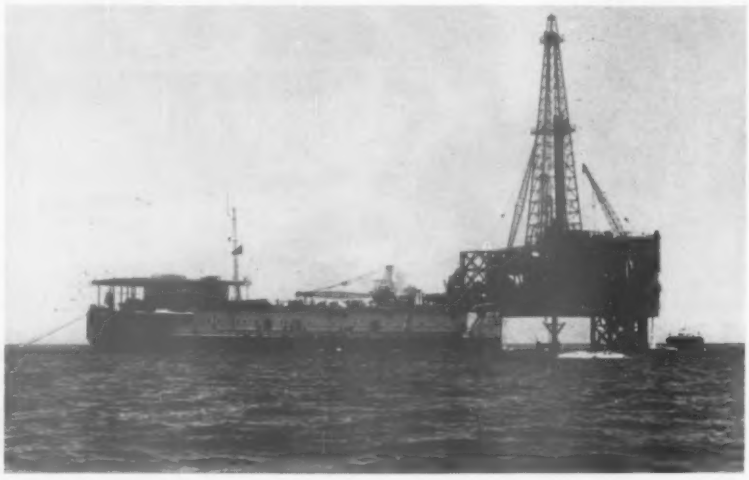
THE FIRST workover rig, especially designed and manufactured for use on offshore platforms, has been delivered to Barnwell Offshore, Inc., of Shreveport, La., by Spencer-Harris Machine & Tool Co., Inc., of Gladewater, Tex.

The new unit has been put into operation in the Gulf of Mexico under contract with Sinclair Oil & Gas Co.

The rig, equipped with a 98-ft. mast and a 9-ft. substructure, is capable of working over wells 16,000 ft. or less in depth.

Built to Barnwell specifications, the rig is broken down into units weighing a maximum of 35,000 lb. each to facilitate handling by platform cranes. The sections are interlocked by pins when assembled on the offshore platform.

Requiring a maximum platform space of 11 ft. in width, the rig is equipped with the hydraulically operated Spencer - Harris 437,000-lb.-capacity patented socket-lock mast.



International coordination puts drilling project in action

THIS EQUIPMENT which has been in the news lately, is a symbol of international coordination. Truly international in scope, the venture proved successful. Shown above are the mobile drilling platform, the C. E. Thornton, and the tender, J. W. Bates, owned by Reading & Bates Offshore Drilling Co., Tulsa. Reading & Bates have joined forces with International Drilling Co., a Hague-based firm and are working for Arabian Oil Co. in the Persian Gulf.

Arabian Oil is a Japanese company that obtained a concession of the Neutral Zone from the Kuwait and Saudi Arabian governments.

The first well began last July 19 and at 1,500 ft. the well blew out and caught fire. Paul N. (Red) Adair, Houston firefighter, was called and subdued the well after a 9-day battle. Approximately $1,000,000 damage was done to the rig and auxiliary drilling equipment and the platform was damaged to a minor extent. On November 29 drilling began again with a replacement rig 106 days after the well blew wild.

Early in February the test encountered a Cretaceous sandstone at 4,900 ft. and produced 6,290 bbl. daily. Originally scheduled for 8,000 ft., the well will be completed from this zone. The platform is a three-legged LeTourneau design and will probably be used for subsequent development.

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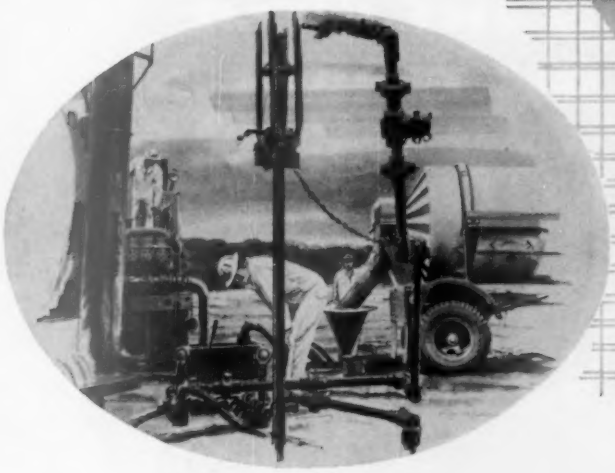
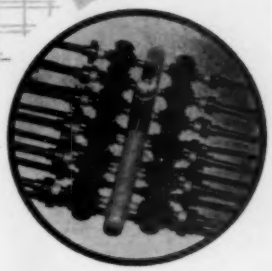


FOR LOWER MAINTENANCE COST



COMPARE THESE ADVANCED FEATURES WITH ANY OTHER PLUG VALVE . . .

ECONOMICAL TO BUY . . .
you'll like the lower initial cost.

ECONOMICAL TO USE . . .
plug and inserts can be replaced with valve in the line. No matching parts to require factory repairs. Less maintenance cost. Lowest replacement parts cost.

EASY TO OPERATE . . .
the LO-TORQ balanced cylindrical plug is not subject to longitudinal loads. Adjusts easily for proper operating torque.

LIGHTWEIGHT . . .
ideal for use on mobile equipment.

LONG SERVICE LIFE . . .
the body forging and adjusting nut are alloy steel for stamina and dependability. The specially coated plug resists wear and corrosion.

LO-TORQ FOR GENERAL SERVICE

Available sizes for general service work are 1″ and 1½″ (15,000 psi), 2″ (10,000 psi) and 3″ (3,000 and 6,000 psi). They are effective in all liquid, gas and slurry pressure applications . . . cementing, drilling, fracturing, acidizing, mud systems, and numerous other applications.

LO-TORQ FOR UNITIZED CHRISTMAS TREES

All the LO-TORQ design advantages are retained in this new series . . . plus a positive seal between the plug and inserts. Valves for 900, 1500, and 2900 Series unitized installations are available for both single and multiple completions. Sizes are 2″ (3,000, 5,000 and 10,000 psi), 2½″ (3,000, 5,000 and 10,000 psi) and 3″ (3,000 and 5,000 psi).

"ANOTHER AID TO BETTER PETROLEUM ENGINEERING — FROM HALLIBURTON"

HALLIBURTON CEMENTING SERVICES

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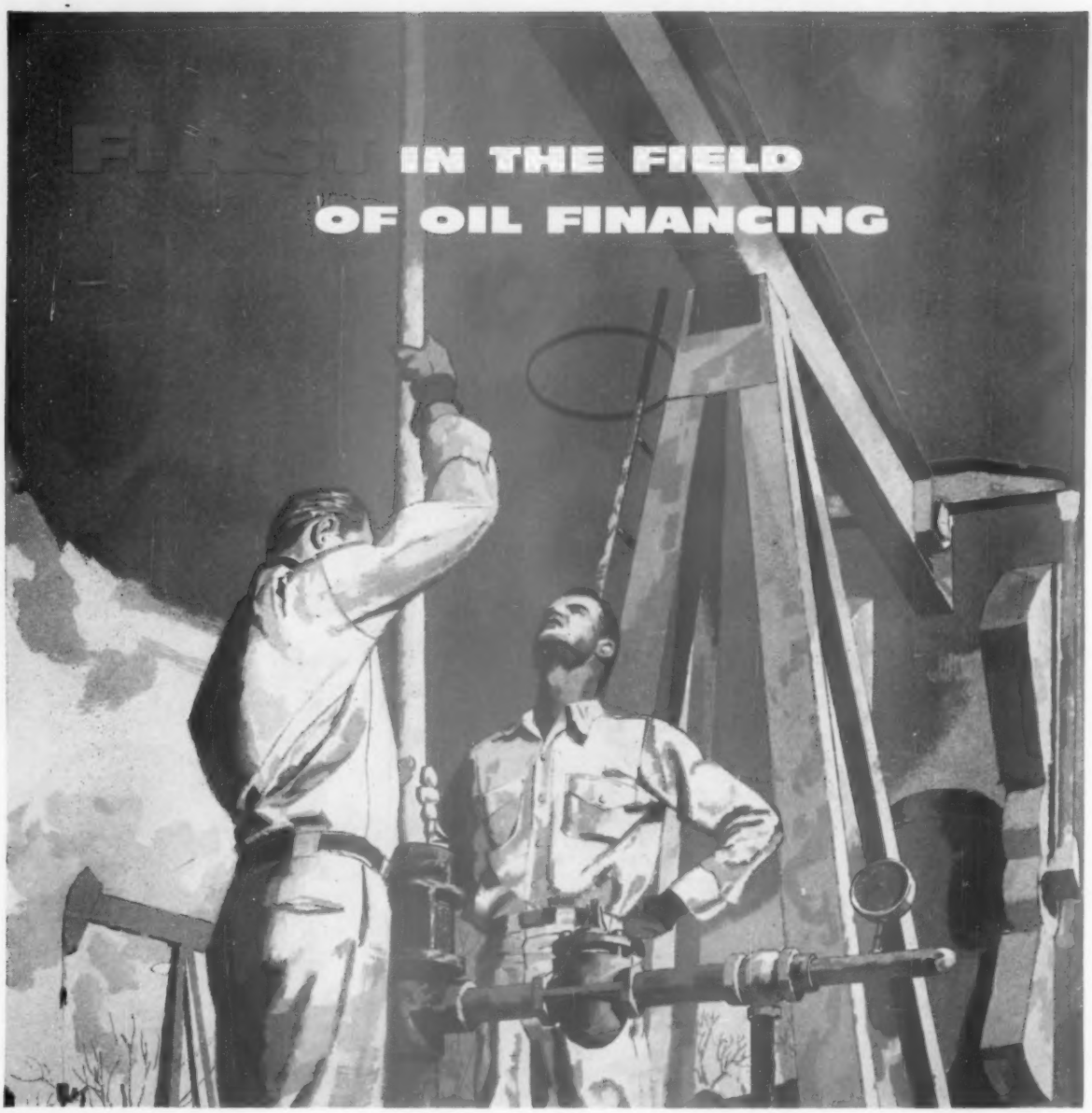

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Mississippi is still a good place to look for oil

BY PETER B. BIKE

CHANCES ARE that if Mississippi is part of your operating area, you are already aware of the 39 salt domes shown on map. It is also likely that you have plans for drilling in one or more of these areas in the near future. The total number of salt domes in the state may ultimately approach 100. In some fields, relationship to a deep-seated salt dome has been established only after extensive development. Quite possibly many oil fields not now considered domes will prove to be associated with salt intrusion.

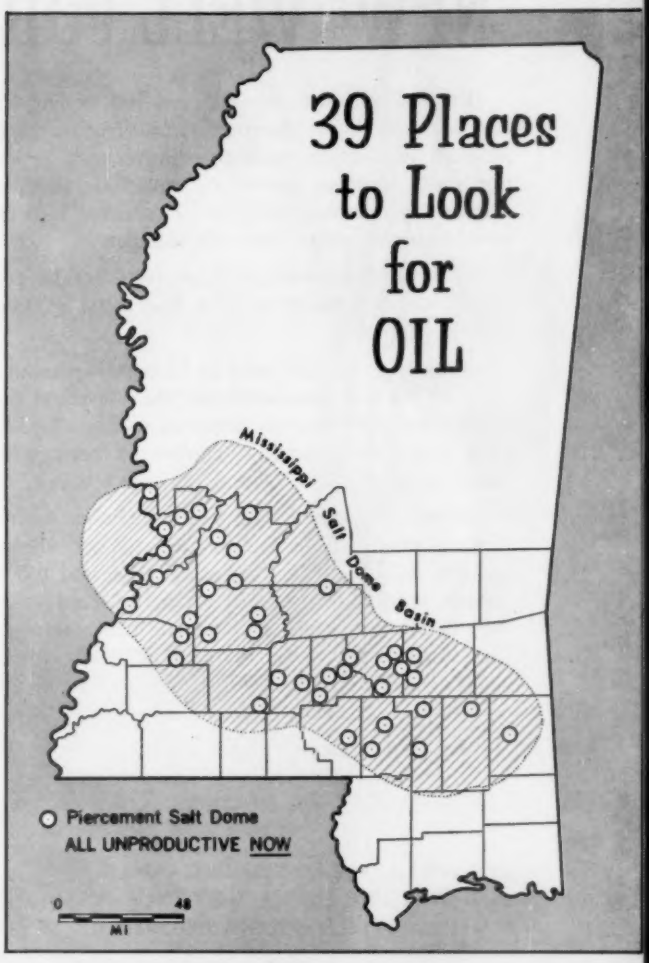
The record now indicates that not one of the 39 salt domes is currently productive. Some have been tested, but only an extreme pessimist would condemn any domal area until the entire sedimentary section has been penetrated and proved barren. This is difficult when the drilling density is inadequate to fully evaluate the specific locale.

Perhaps there may be an associated feature with some of the structures. Stratigraphic considerations may exist in the trough between two related features. Off the flanks, untested fault traps may be present. Some of the domes may have a nonproductive graben block running across the top with a dry hole on it, yet further investigation is warranted across the fault line.

Domes are habitats for oil. There are relatively few producing domes in comparison to the total number of fields in the state. Mississippi has at least 55 known salt domes. Most of these were found from 1940 to 1949 when 43 (or 75%) were uncovered. The lean years for dome locations have been since 1949 with only 10 domes established.

Oil is a relative newcomer to Mississippi. Although gas was found at Amory in Monroe County in 1926 and later in Jackson in 1930, the first oil occurred at Tinsley in 1939.

A map published in the Journal as part of an article by Neil Williams, associate editor, appeared in the June 16, 1938, issue (p. 20 ff.). Fifty-one "prospects" (indicated structures worthy of additional evaluation) were shown on this map, and details were given as to the exploration method used—gravity, seismic, surface geology, torsion balance, or magnetometer. Operators were also listed. The gist of this article—written nearly 15 months before the state's first oil was found—was that activity was increasing and the continued high level of exploration should result in bringing Mississippi into the fold of producing states.



THESE 39 KNOWN SALT DOMES are not producing yet. Oil may be found in each of these areas.

The prospect map has proved to be extremely interesting. Not all the features shown on it were domes, but many have been productive. Some turned out to be simple anticlines, regional noses, or fault traps. It is significant that over 20 of these prospects are included among the more prominent fields now producing in the state.

Mississippi may profit from the lesson learned in East Texas where 6 out of 18 known domes are now oil bearing. In the past 4 years, five of the six domes have been brought into production. For our money, we concur with Neil Williams and his 1938 philosophy. Mississippi is still a good place to look for oil.

DOWELL CUSTOMER GETS

"NEW" WELL FOR PRICE OF FRAC JOB

Engineered fracturing—as practiced by Dowell—can do many things for producers. Treatments can increase production, reduce workover and production costs, improve gas/oil or water/oil ratios, and increase recoverable reserves. Fracturing has even saved valuable wells from abandonment.

A Texas Panhandle producer feels like he got a "new" well for the price of a frac job . . . here's how it happened:

Production had declined to 11 bopd—pumping—from an old well completed into the Cleveland sand. Completion was through perforations from 6420 to 6458 feet. Workover was considered because new offset wells tested 400 bopd on completion.

Dowell engineered a fracturing treatment with the "Frac Guide"*. Waterfrac was selected for efficiency and low cost. 40,000 gallons gelled water and 105,000 pounds sand were used. 70 gallons of Freflo* were used to prevent emulsions, and 100 ball sealers were used to divert part of the treatment into less permeable zones. Injection rate was 65 bpm at 900 to 1400 psi down seven-inch casing.

Following treatment, *production stabilized at 105 bopd flowing.* Payout time for fracture treatment was four months.

DOWELL FRACTURING AND ABRASIJET HELP GET GOOD PRODUCTION FROM "PROBLEM" FIELD

Wells in the Langlie Mattix field of Lea County, New Mexico, are hard to produce. The oil pay of the Seven Rivers formation is tightly sandwiched between water below and gas above. It will not produce satisfactorily without stimulation—yet fracturing usually results in water or gas rather than oil.

Dowell engineers suggested a two-stage treatment that is working extremely well. First, Abrasijet* is used. The jetting tool is set in the middle of the oil zone at about 3585 feet, and the walls of the open hole are jetted with oil and sand. This produces considerable enlargement of the well bore.

Then wells are fractured, using 10,000 gallons lease crude and 10,000 pounds sand. This relatively small treatment is designed to provide the needed stimulation without breaking through to either gas or water.

Success has been outstanding. *The first fifteen wells treated are all producing their allowables; only two are producing appreciable water and none have broken through to gas.*

OPERATOR USES DOWELL FRACTURING TO STRETCH OUT DECLINE CURVE

Wells completed in the 'D' sand of the Southwestern Wayne pool in McClain County, Oklahoma, had not responded well to fracturing. Usual treatments had been 10,000 to 20,000 gallons of refined oil carrying one pound of sand per gallon. Initial production would be satisfactory but production would decline rapidly—frequently approaching pre-treatment levels in less than a month.

Dowell engineered a treatment with the "Frac Guide". Petrojel* was recommended for a well completed through perforations from 6977 to 6994 and from 7062 to 7076 feet. 20,000 gallons gelled crude with F.L.A.* (Fluid Loss Additive) and 46,000 pounds sand were used. 25 ball sealers were injected at mid-treatment. Injection rate was 21 bpm. *Before treatment, production was 10 bopd. Three months later, production had STABILIZED at 30 bopd.*

GOOD GAS/OIL RATIO RESULTS WHEN KANSAS OPERATOR USES DOWELL FRACTURING AND ABRASIJET

Wells completed into the Mississippi Chat of the Spivey-Grabs pool in Harper County, Kansas, have a GOR limit of 3000/1. An operator wanted to fracture to improve production—yet not break through to gas. Abrasijet was used to perforate casing at 4464 feet. Then, following treatment with 500 gallons Mud Acid, well swabbed 12 barrels of oil in seven hours.

After fracturing with water and 3500 pounds sand the well *flowed* 10 boph on a ¼"-choke. *Gas/oil ratio was only 1323/1—exceptionally good for the field.*

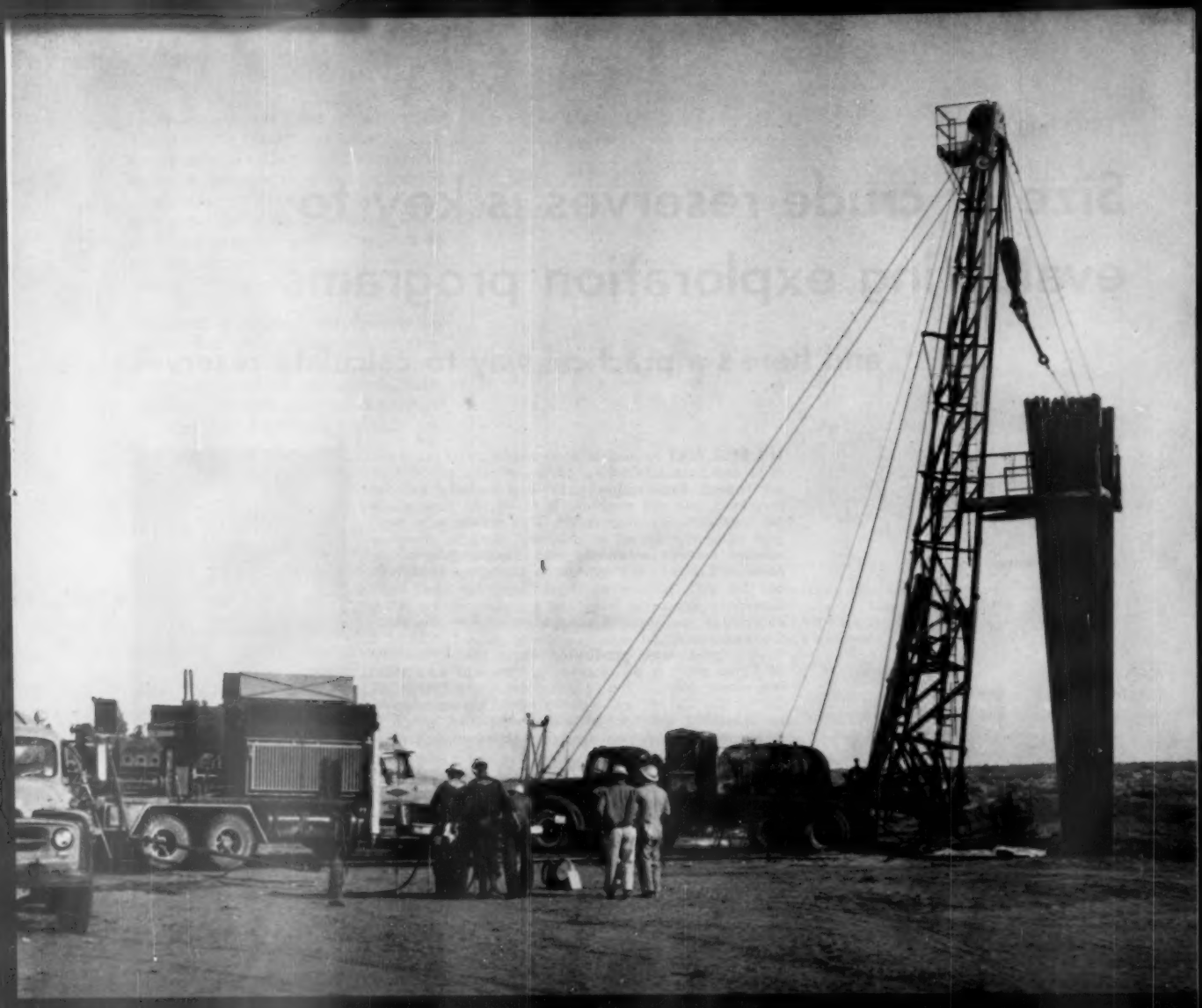
Your Dowell engineer can help you select a treatment to solve your well problem. Call him for further information or service. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Argentina, and Venezuela. Dowell, Tulsa 1, Oklahoma.

*Dowell Trademark

Services for the oil industry

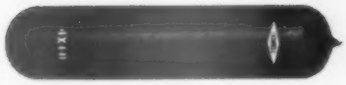
DOWELL

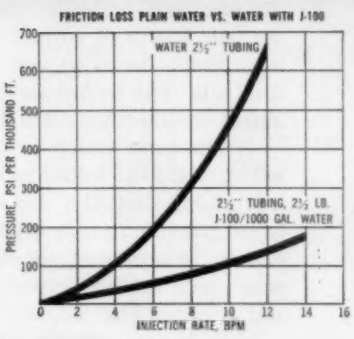
DIVISION OF THE DOW CHEMICAL COMPANY



NEW IDEAS FROM DOWELL

TO HELP YOU MAKE MORE PROFIT





ROCKSHOCK*

This new Dowell service employs glass *implosion* capsules to clean formations or reduce breakdown pressures ahead of fracturing or acidizing treatments. Hydrostatic pressure is used to break the capsules. This action releases powerful pressure waves — to remove scale and other deposits, break emulsion blocks, and to initiate fractures.

ABRASIJET

This Dowell-developed service employs a special new tool to direct high velocity streams of abrasive-laden fluid against pipe or formation. The service is used to perforate pipe and penetrate through the damaged area near the well bore. Operators have also used it to clean and enlarge open holes. Results have been consistently excellent.

J-100

J-100 is Dowell's new, improved thickening and friction reducing agent for fresh water. It effectively improves the sand-suspending qualities of water. More important, however, is its ability to reduce friction losses and pump requirements by more than one-half as shown on the graph. The result can be better fracturing at lower cost.

Predicting the

Size of crude reserves is key to evaluating exploration programs

. . . and here's a practical way to calculate reserves

J. R. ARRINGTON

THE BEST WAY to evaluate an exploration program is to compare oil-finding costs with the amount of oil found. Exploration costs can usually be determined, but the problem is to decide how much oil was actually discovered. This article tells how one company found a practical way to develop current reserve estimates into dependable future reserve figures. The author is currently chairman of the API oil-reserve committee for the Mid-Continent area. He is also a member of the AGA committee on natural-gas reserves for the Mid-Continent area.

Arrington was graduated from the University of Tulsa with a BS degree in chemical engineering, and joined the production department of Carter Oil Co. A few months later, he transferred to Standard Oil Co. of Venezuela and spent 5 years in South America as a petroleum engineer with that company.

In 1942, Arrington returned to Carter operations in the U. S. and was engaged in engineering work for the next 9 years. He was named the company's chief economist in 1951, and became manager of the company's economic department in 1955.

EVERY COMPANY searching for crude-oil reserves is constantly faced with the problem of evaluating its exploration program. The efficiency of a program can best be measured by relating exploration expenditures to the barrels of oil found. Usually the dollars can be determined or estimated, but the barrels of oil discovered by these expenditures are difficult to establish. The industry does not immediately know the size of its discoveries; there is a definite time lag before the adequate valuation of reserves can be made. Thus the true results of current exploration are not known. Unfortunately, oil men must make decisions involving large financial risks before they know all of the facts. The techniques for adjusting reserves described in this article are aimed at improving the evaluation of exploration programs much earlier.

The most widely accepted published estimates of oil found by current wildcats are the initial estimates of discoveries by the API. These data have limitations. Initially, the estimates are conservative but more important, it is not possible to follow changes in a given year's discoveries or to trace their growth. Each year subsequent changes in the estimates of a particular year's reserves are lumped with discoveries of other years as they are extended and revised. The industry needs a system which will:

1. Isolate reserve estimates, grouping them by year of discovery.
2. Allocate each reserve change back to the year of discovery.
3. Adjust current estimates for future revisions.

Such a system was developed in the mid-1940's for use with Carter's industry reserve statistics; it has been in use for over 10 years and has given a realistic measure of the results of each year's exploration effort. This system follows the reservoirs discovered each year and provides for statistically adjusting current estimates for future revisions; the result is a probable final estimate for each year's discoveries.

It is the purpose of this article to show how the adjustment factors can

be developed and some of their uses. The probable final factors shown here are applicable only to Carter's reserve statistics, because they are a function of the manner and rate in which Carter's personnel estimate reserves. However, the principle can be applied to any set of reserve data which groups reserves by year of discovery.

Growth is normal. Experience has shown that reserve changes are usually upward. For the first 2 or 3 years after a reservoir is discovered, there will be both upward and downward revisions but the trend is usually upward.

The amount of growth is a function of knowledge and size of the virgin reservoir. The greater the knowledge of a new reservoir, the more accurate will be the initial estimate. Large fields normally have greater increases percentagewise than small fields. The philosophy of the estimating group affects also the rate of revision. If a conservative policy is followed in booking unproven reserves, the future changes in reserves obviously will be higher than for a more optimistic estimating group. Regardless of the factors affecting it, growth is normal, although the amount varies from area to area and with various estimating groups.

Definitions. Before developing the method, the following terms should be explained (Reference will be made to three types of reserve estimates):

1. The initial estimate—this is the first estimate of reserve for a new reservoir or the estimate as recorded at the end of the discovery year.
2. Revised estimate—this is the estimate at a specific point in time after the initial estimate. It includes reserve changes year by year after the discovery year.
3. The probable final estimate—this is a statistically developed estimate which anticipates future revisions, and is the estimate to be described in this paper. Revised estimates approach the probable final estimate with each year of revision.

Description of the method. To develop a statistical method of predicting future revisions, the growth of discoveries must be followed from year to year; this requires that reserve estimates be grouped by year of discovery. Only a few companies maintain such records for all fields discovered by the industry.

If reserves are maintained by year of discovery for a number of years, the rate of growth of each year's discoveries can be followed. The mechanics are outlined in detail later in this paper. The principle that is followed is relatively simple.

COLUMN →	①	②	③	④	⑤	⑥	⑦	⑧	⑨
YEAR OF DISCOVERY	YEAR OF REVISION							SUM	
	1948	1949	1950	1951	1952	1953	1954	1948-53	1949-54
1940	I	J	K	L	M	N	O		
41	H	I	J	K	L	M	N		
42	G	H	I	J	K	L	M		
43	F	G	H	I	J	K	L		
44	E	F	G	H	I	J	K		
1945	D	E	F	G	H	I	J	I_1-I_6	J_2-J_7
46	C	D	E	F	G	H	I	H_1-H_6	I_2-I_7
47	B	C	D	E	F	G	H	G_1-G_6	H_2-H_7
48	A	B	C	D	E	F	G	F_1-F_6	G_2-G_7
49		A	B	C	D	E	F	E_1-E_6	F_2-F_7
1950			A	B	C	D	E	D_1-D_6	E_2-E_7
51				A	B	C	D	C_1-C_6	D_2-D_7
52		SUM A_1 TO A_6			A	B	C	B_1-B_6	C_2-C_7
53						A	B	A_1-A_6	B_2-B_7
54							A		

RESERVE HISTORY is a clue to future reserve changes. The key to statistically adjusting present reserve estimates for future revisions is a reserve record maintained by year of discovery. The above chart illustrates how a given year's estimate compares with the preceding year's estimate. Fig. 1.

A record of reserves is maintained for a number of years. The original estimates for the discoveries are compared with the second year's estimates to determine the percentage increase that has been made 1 year after the fields were discovered. Similarly, the second year estimates are then compared with the third year, giving a percentage increase for one additional year's experience. This record can then be continued indefinitely for any number of years to determine the rate of growth for each year over the preceding year. In effect, you are determining the running rate of growth with time with a constantly changing group of fields. For example, in the fields that were found 25 years ago, we can determine how much we revised them up over the previous year and determine the rate of growth for fields between 24 and 25 years.

This group of fields obviously is a different group than the fields that are only 5 years old. Our experience has shown that these rates of growth vary from size of fields, as well as geographical locations. Once you have determined the rate of growth, year by year, for your method of estimating reserves, then you can develop a factor to apply to your current estimate to adjust it for anticipated future revisions based on experience which you have had in the past.

By arranging the discovery data in the manner shown on Fig. 1, the rate of growth can be determined. Seven years of revision history are shown for the period 1948-54. For convenience, letters instead of barrels are used to indicate the reserve estimates. The initial estimate is shown by the letter "A." The first revision to the initial estimate is symbolized by the letter "B," the second revision (or estimate recorded in second year after discovery) is "C," etc. From this statistical record can be calculated the growth rate of past estimates of reserves. The method by which this is done is also shown in columns 8 and 9 of Fig. 1. The initial estimates for the years 1948 to 1953 are added and placed in column 8 (A_1 to A_6). The first year revisions to these estimates are added and shown on the last line of column 9 (B_2 to B_7). The per cent increase of the first revision over the prior year's estimate is calculated as follows:

$$\frac{(B_2 \text{ to } B_7) - (A_1 \text{ to } A_6)}{(A_1 \text{ to } A_6)} \times 100$$

To calculate the increase in the reserve at the end of the second year over the prior year estimate, the formula becomes

$$\frac{(C_2 \text{ to } C_7) - (B_1 \text{ to } B_6)}{(B_1 \text{ to } B_6)} \times 100$$

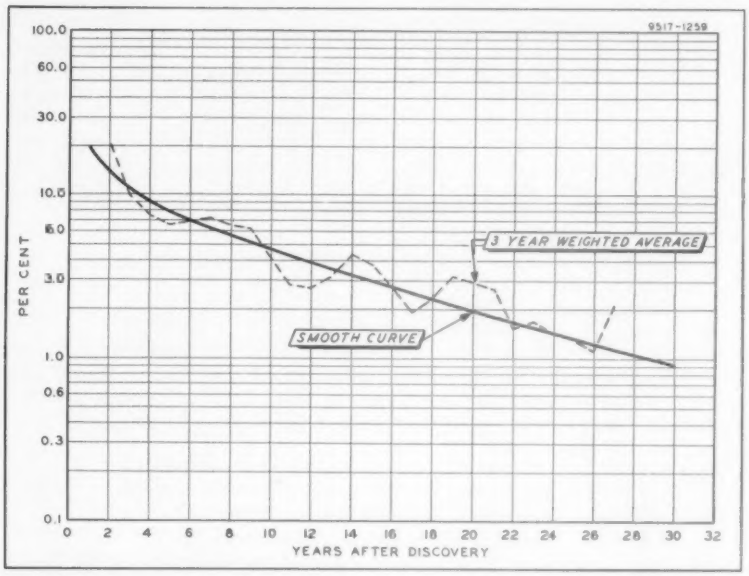
Continuing this technique the change each year of estimates from the prior year's estimates is developed.

Actual increases are shown in Fig. 2 for Kansas and Oklahoma. Twelve years of revision history (1943-1954) were used. The two columns under the heading "Sum of Estimates" are

Year	Year of Revision	Sum of Estimates* 1943-53	Sum of Estimates* 1944-54	Increase Over Prior Year's Estimate Amount*	Increase Over Prior Year's Estimate Percent (3 Yr Wt'd Avg)
1926	28	2 500	2 621	121	-
27	27	2 980	3 009	29	2.1
28	26	3 545	3 581	36	1.1
29	25	3 844	3 898	54	1.3
1930	24	3 952	4 014	62	1.4
1931	23	3 688	3 730	42	1.7
32	22	3 477	3 563	86	1.5
33	21	3 619	3 656	37	2.7
34	20	3 460	3 619	159	2.9
1935	19	3 439	3 548	109	3.2
1936	18	3 390	3 456	66	2.3
37	17	3 020	3 069	49	1.9
38	16	2 656	2 716	60	2.7
39	15	1 846	1 943	97	3.7
1940	14	1 572	1 638	66	4.3
1941	13	1 404	1 449	45	3.1
42	12	1 336	1 361	25	2.7
43	11	1 413	1 456	43	2.8
44	10	1 307	1 353	46	4.1
1945	9	1 249	1 321	72	6.2
1946	8	1 367	1 492	125	6.5
47	7	1 503	1 574	71	7.2
48	6	1 336	1 444	108	6.8
49	5	1 177	1 272	95	6.5
1950	4	1 246	1 289	43	7.4
1951	3	1 142	1 269	127	9.9
52	2	1 063	1 235	172	20.4
53	1	775	1 083	308	-

* Millions of Barrels

RESERVE CHANGES have continued in Oklahoma and Kansas for as long as 30 years after discovery. The rate of revisions decreases rapidly during early years, reflecting development drilling; production experience necessitates continuing reserve additions. Fig. 2.



THE BASIS for predicting future revisions is a smooth curve drawn through the year-to-year percentage changes developed on Fig. 2. Fig. 3.

the comparable columns to 8 and 9 on Fig. 1. The amount of increase and a 3-year weighted average per cent increase are also shown.

The 3-year weighted average is plotted on Fig. 3 and a smooth curve drawn. The smooth curve represents the average per cent increase of any estimate over that of the prior year. The percentages from the smooth curve are shown on Fig. 4 and from these are calculated percentage factors which are accumulated to show a total effect of increases over the initial estimates for 30 years after discovery. On Fig. 4 the cumulative factor for Kansas and Oklahoma is 3.54. This is the number which is applied to the initial estimate only to adjust it to a probable final estimate. Note that each subsequent year brings additional revision history and a smaller factor is applicable. For example, after 10 years of revision history—the eleventh year since discovery—the factor is only 1.512 as compared to the initial revisions factor of 3.54.

One of the unique advantages of this system is that it always makes use of the latest and most current reserve estimates. Each additional year of revision history decreases the factor applied as the revised estimate gets closer and closer to the probable final estimate.

To indicate the magnitude of future revisions in an area, the probable final factors were applied to Carter's current revised discoveries for Kansas and Oklahoma. By the application of the factors, it is estimated that current booked discoveries will be increased a total of 2 billion barrels by future revisions. This is 15% of the total oil found and booked to date and about 60% of total current remaining reserves. The probable final estimates include only primary revisions; future secondary-recovery additions must be determined separately.

Reserve additions of this magnitude may be surprising to those who have not been associated with a group estimating reserves for all fields. There have been some industry groups who have suggested that after 6 years most fields will not be revised again. This might be true for a specific field but it is definitely in error for any large group of fields. Groups of fields are revised even in the last years of life.

However for a given company's discoveries, revisions might well be smaller. In general reserve groups have less information for making the initial estimate for all new reservoirs than would be available for company discoveries. It follows therefore that one would expect the probable final factor for the zero year (applied to the initial estimate) to be less for company experience than for estimates of reserve of the entire industry.

The advantage of the probable final concept. The most important advantage of having probable final estimates is the ability to measure results of the current exploration programs. The

"Our men like to use Edward Mudwonder Valves...

...what more could you ask for?"

Ray Bounds, Tool Pusher for the Bay Drilling Corp., Thibodeaux, La., has an excellent reason for using Edward Mudwonder valves on the Drilling Barge Rome. Here's what Ray says:

"We've just drilled seven holes in ten months. And we're ready to start on number eight as soon as we get on location. If you know Southeast Louisiana, you know that these are deep wells—13,000 footers—and working pressures sometimes hit 2800 pounds. To keep up a schedule like this means we have to have high-class equipment and good crew morale. *Having good equipment is the biggest morale booster we have.*

"Our Mudwonder mud valves are the kind of equipment the men like to use. Mudwonders are easy to open and close even at high pressure with heavy mud and seventy pounds per barrel of lost circulation material. If our Mudwonders need to be inspected or serviced, the men can tend to it quickly without removing the valves from the line. What more could you ask for?"

The confidence Ray Bounds has in Edward Mudwonder valves is found wherever you go in the drilling fields. Mudwonder valves are built in 2", 3" and 4" sizes, with screwed or flanged ends, for 2000 psi WP (4000 psi test) and 3000 psi WP (6000 psi test) service and in 2" size for 5000 psi WP (10,000 psi test) service. See your favorite oil field supply store, or write Edward Valves, Inc., 1212 W. 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company.

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another fine product by
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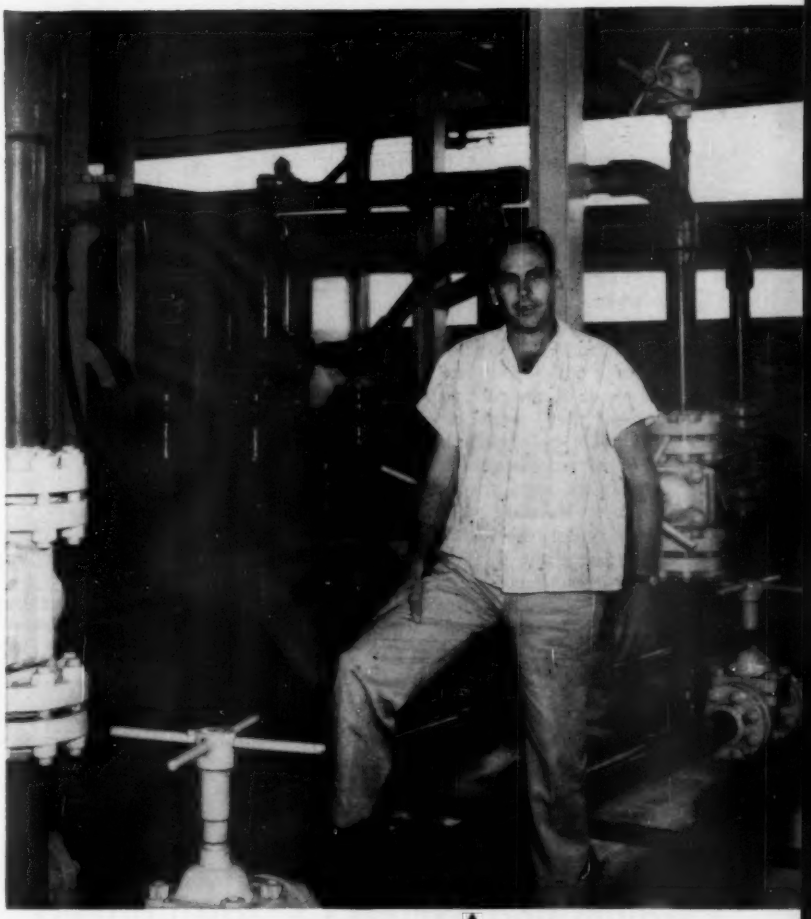
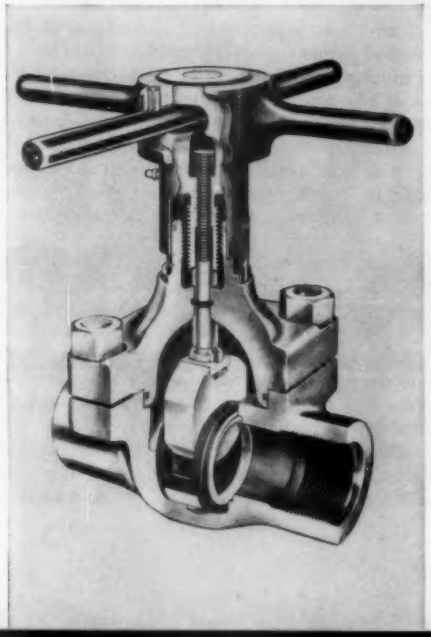


▲ Ray Bounds, Tool Pusher for the Bay Drilling Corp., finds that his men like Edward Mudwonder valves because they are easy to operate and easy to maintain.



◀ Mudwonder cut-away view shows the one-piece seat insert with Buna-N molded integrally over steel wear rings; chromed gate with "T" slot connection; separated stainless stem and double thread construction.

probable final estimate is not the actual final estimate which will be booked. It is not expected to be. However, it is so much closer to the final answer than the initial and revised estimates that it warrants usage if applied properly. By dealing with the reservoirs found in a given period and relating these to the funds spent looking for these reservoirs, one can determine the efficiency of funds spent. This is a valuable tool for management in helping them learn now facts which might not otherwise be available for 5 to 10 years.

Limitations. Studies of this type can be used improperly. Since the probable final concept is a probability concept, it follows that the greater the number of statistics used, the greater is the probability of final accuracy. Factors which are developed for an area may have little bearing to history for a specific field. The factors shown for Oklahoma and Kansas are a function first of all of the reserve records from which they were developed. They would not be applicable to any other group of records. (However, the principle can be used for any company's reserve records, all that is needed is to group reserves by year of discovery.) Therefore, the first limitation is that these factors should not be applied to a smaller number of statistics than the group from which it was derived (never to a single field).

Secondly, history is needed to follow the rate of growth. Companies who have not grouped their reserves by year of discovery in prior years would be unable to compile such an analysis immediately. However, starting now to group reserves by year of discovery would give the first year of data. In 5 years time, sufficient history would be available to initiate the first analysis.

In spite of its limitations, the probable final system is more accurate than relying upon revised estimates. It allows knowledge today about the results of exploration effort and certainly any management of a large oil company is handicapped without it. The system could be adopted to any company's reserve data.

Year of Revision	Increase Over Prior Year Estimate (Smooth Curve)	Probable Final Factors**
0	-	3.540
1	20.0	2.950
2	13.5	2.599
3	11.0	2.341
4	9.0	2.148
5	7.7	1.994
6	7.0	1.864
7	6.2	1.755
8	5.6	1.662
9	5.1	1.581
10	4.6	1.512
11	4.2	1.451
12	3.8	1.398
13	3.5	1.351
14	3.2	1.309
15	2.9	1.272
16	2.7	1.239
17	2.5	1.209
18	2.3	1.182
19	2.1	1.158
20	1.9	1.136
21	1.8	1.116
22	1.7	1.097
23	1.5	1.081
24	1.4	1.066
25	1.3	1.052
26	1.2	1.040
27	1.1	1.029
28	1.0	1.019
29	1.0	1.009
30	0.9	1.000

* Based on 12 Years of Revision History - 1943-1954
** Cumulative Increase

PROBABLE FINAL FACTORS statistically anticipate future revisions and are developed by accumulating year-to-year percentage changes. The application of these factors to current discovery estimates provides a better measure of exploration results. Fig. 4.

Cardium find excites Canadian drillers

THE FIRST major Cardium Cretaceous sand oil find since Pembina days is fast developing at Carstairs, 25 miles northwest of Calgary. Recently a 2-mile northwest extension to the Creek Oil of Canada 1958 discovery was assured of production, coupling it to another well drilled 1 mile south of the original well.

This extends the Carstairs area to 3½ miles long. Two other wells are drilling in the trend, one by the Cree team, the other by a group operated by Canadian American Royalties. Others are sure to follow in short order.

New hit. The newest addition to the Carstairs area found 15 ft. of pay in the Cardium. This well is operated by Cree, drilled jointly with Canadian Export Gas & Oil, Ltd., Alminex, Ltd., and Provo Gas Producers on acreage acquired under farmout agreement from Home Oil Co. The 15-ft. pay compares to an average 15 ft. of pay at the other two wells and to 7 ft. in Westcott field, 3 miles northwest.

Although the well hasn't been tested, information from logs and cores is sufficient to indicate that the same sand is present as the one in the discovery hole. Production casing has been run.

The well is the Cree et al. 16-9-30-3 Carstairs on LSD 16, 9-30-3w5. It lies near the discovery well, Carstairs 6-2-30-3, and the southernmost well at Westcott, Stekoll 6-29 Westcott. Total depth of the 16-9 Carstairs is 6,900 ft. The pay is at 6,830 ft.

More wells due. Although major development plans of either team have not been reported, it is understood that the Cree-CEGO Group has about 20 wells slated while the Canadian American team has enough acreage for 12 sites and are continuing to pick up acreage in the area.

In addition to the Cree-CEGO team and the Canadian American - Penwa Oils, Ltd. - Conick Petroleum, Ltd., group, Western Leaseholds, Ltd., Scurry Rainbow Oils, Ltd., Craven Development, Ltd., Home Oil Co., Security Freehold, Ltd., French Petroleum Co., and Canadian Superior of California, Ltd., are major land holders in the district.

Pipeline. Beauty of the whole play is that the Cremona Pipeline Co.'s artery from Sundre to Calgary skirts the field less than 2 miles to the west. A tie-in to that line will give backers a ready market. Oil now goes by truck to Calgary. Each of the wells produce 50 bbl. per day.

January footage account

	FIELD WELLS					WILDCAT WELLS			
	Oil	Cond.	Gas	Dry	Service	Oil	Cond.	Gas	Dry
Alabama	41,456	.....	.....	.....	.....	.....	.....	.....	.....
Alaska	.....	.....	.....	11,774	.....	.....	.....	.....	.....
Arizona	.....	.....	.....	.....	.....	.....	.....	.....	9,598
Arkansas	79,836	.....	16,967	45,267	.....	.....	.....	4,763	42,170
California	351,725	.....	37,643	41,954	14,633	16,384	.....	19,399	149,876
Colorado	45,650	5,707	43,684	69,402	.....	9,180	.....	32,331	148,602
Florida	.....	.....	.....	.....	.....	.....	.....	.....	6,437
Illinois	174,362	.....	5,075	118,041	68,319	12,153	.....	.....	79,625
Indiana	67,954	.....	.....	29,300	.....	.....	.....	.....	41,583
Kansas	421,210	.....	53,420	230,751	21,102	56,492	.....	.....	306,883
Kentucky	83,347	.....	52,651	18,997	6,754	3,657	.....	.....	33,462
Louisiana	975,145	455,170	122,322	689,771	6,550	14,520	.....	32,689	327,444
North	150,349	.....	49,642	101,975	.....	6,015	.....	21,689	55,592
South	524,465	379,415	61,130	468,533	6,550	8,505	.....	11,000	259,852
Offshore	300,331	75,755	11,550	119,263	.....	.....	.....	.....	12,000
Michigan	52,422	.....	4,395	38,114	.....	.....	.....	.....	70,303
Mississippi	298,930	29,297	4,681	104,889	9,670	31,131	.....	.....	218,725
Montana	53,393	.....	.....	19,232	.....	5,130	.....	1,959	58,255
Nebraska	79,400	.....	.....	174,573	.....	46,497	.....	.....	99,840
New Mexico	498,898	71,705	106,249	52,423	2,308	13,825	.....	.....	111,384
West	103,247	50,320	106,249	11,037	2,308	.....	.....	.....	15,507
East	395,651	21,385	.....	41,386	.....	13,825	.....	.....	95,877
New York	17,550	.....	2,910	.....	12,150	.....	.....	.....	4,806
North Dakota	107,651	11,902	.....	40,591	.....	.....	.....	.....	23,071
Ohio	128,182	.....	96,111	43,932	21,771	7,462	.....	.....	11,555
Oklahoma	560,585	94,452	171,579	277,474	7,382	49,489	28,420	46,422	243,080
Oregon	.....	.....	.....	.....	.....	.....	.....	.....	2,627
Pennsylvania	25,561	.....	122,454	16,702	22,400	.....	.....	7,048	14,446
South Dakota	.....	.....	.....	.....	.....	.....	.....	.....	9,571
Texas	3,390,875	712,087	393,403	1,209,600	33,059	108,124	73,820	30,821	1,392,084
District 1	86,649	38,175	34,573	42,733	.....	9,523	.....	.....	130,232
District 2	136,383	74,636	51,598	82,200	.....	8,002	12,750	1,864	101,904
District 3	260,731	266,239	40,293	198,077	.....	20,414	18,097	.....	197,030
District 4	142,472	169,822	92,940	213,393	.....	.....	37,445	15,070	150,737
East	311,144	41,411	7,550	139,596	.....	21,386	5,528	.....	182,868
District 7-B	242,666	9,039	8,131	99,965	.....	21,161	.....	9,997	173,003
West	1,719,078	58,612	60,499	274,196	.....	13,159	.....	.....	266,308
District 9	271,717	18,055	43,595	143,238	33,059	14,479	.....	3,890	150,301
District 10	220,035	36,098	54,224	16,203	.....	.....	.....	.....	39,701
Utah	39,345	.....	32,992	6,195	.....	8,440	.....	.....	44,320
Washington	.....	.....	.....	.....	.....	.....	.....	.....	8,520
West Virginia	2,151	.....	127,060	17,722	23,909	.....	.....	.....	7,268
Wyoming	137,144	.....	50,433	37,782	5,007	34,964	.....	.....	195,367
Total U. S.	**7,632,772**	**1,380,320**	**1,444,029**	**3,294,486**	**255,014**	**417,448**	**102,240**	**175,432**	**3,660,902**
Western Canada	764,072	.....	51,570	100,440	.....	68,516	.....	52,256	228,894
Alberta	635,421	.....	37,545	77,939	.....	55,580	.....	52,256	150,776
Saskatchewan	110,416	.....	.....	6,260	.....	5,346	.....	.....	62,949
Manitoba	10,447	.....	.....	.....	.....	.....	.....	.....	6,475
British Columbia	7,789	.....	14,025	16,241	.....	7,590	.....	.....	8,694

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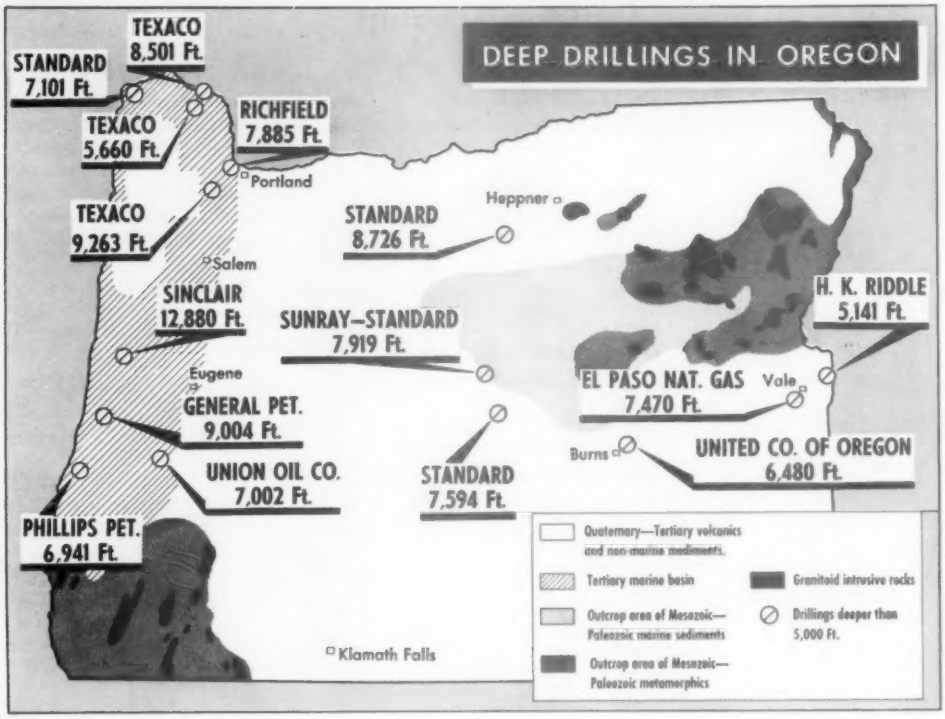
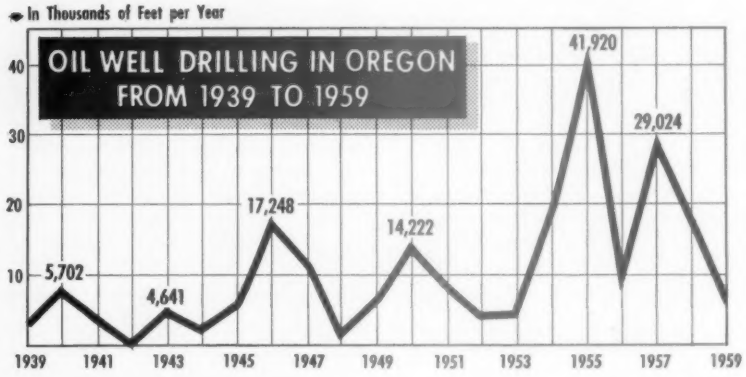


ALL WELLS drilled below 5,000 ft. are shown on this map of Oregon. One-fourth of the state's area is apt to produce oil and gas providing there is enough aggressive exploration.

Current activity . . .



and two decades of drilling attempts indicate . . .

Oregon has hopes, but no production

AT THE BEGINNING of 1960, Oregon is still among the 17 states with no gas and oil production.

Increased exploration over the past 15 years, however, indicates that industry has hopes of eventually finding production in the state. Drilling was very slow in 1959 with only three permits issued.

Drilling permits issued last year were Permit No. 35, Ross R. Mitchell 1 Bliven, NW¼ 15-8s-5w, Polk County. The well went to 1,347 ft. and was abandoned. Permit No. 36, Oregon Oil & Gas Co. 1 Roberts, SE¼ 25-10s-8w, Lincoln County, is idle at 2,630 ft. Permit No. 37, Ross R. Mitchell 1 Paige, SW¼ 11-8s-5w, Polk County, was abandoned at 600 ft.

This article is based on "Oil and Gas Exploration in Oregon During 1959," by Vernon C. Newton, Jr., Petroleum Engineer for State of Oregon Department of Geology and Mineral Industries, from THE ORE.-BIN, JANUARY 1960.

Drilling. Drilling was continued on Miriam Oil Co. 1 Elliott, a deepening project, in Polk County the first quarter of 1959.

Work was abandoned in July after reaching 1,835 ft.

Uranium Oil & Gas Co. 1 Ziedrich in Douglas County and Sunnyvale Oil Co., Inc. 1 Federal-Mitchell in Grant County were plugged and abandoned in April. Riddle Gas & Oil Producers suspended drilling at 1 Aikins in January 1959. Total footage drilled in Oregon last year was 5,192 ft.

Leasing. Oil and gas leasing was active throughout the central Willamette Valley in 1959 as a result of oil and gas shows found in a well drilled by Linn County Oil Development Co. near Lebanon.

Humble Oil & Refining Co. gave exploration activity a big boost when it leased more than 250,000 acres of land in southern Lake County and

about 200,000 acres adjacent to Lake County in northern California. This was the first activity in Central Oregon since abandonment of the joint venture by Sunray Mid-Continent Oil Co. and Standard Oil Co. near Prineville in August 1958. Humble has not announced a drilling program as yet on the new leases.

Field parties. Geologic field parties from three major companies were actively exploring Oregon in 1959 for areas where oil and gas might be found. Several other companies expressed interest during the year in oil and gas prospects of the state and had representatives checking current activities.

Washington activity. Developments north of the border in Washington kept oil interests stirring in the Pacific Northwest last year.

Sunshine Mining Co. continued producing its 1 Medina at Grays Harbor at a 6-10-bbl. per day rate. Sunshine found possible gas production in the same area early in 1959 when it deepened a well which was drilled by Hawksworth Gas & Oil Development Co. in 1951. During August 1959, Tideland Oil & Gas Co. found oil on a formation test at 3,400 ft. at its Carlisle Estate well 12 miles north of Grays Harbor. Casing has been run in the well, but no production obtained as yet.

Oregon footage. Total footage drilled per year in Oregon for oil and gas exploration is shown on the graph for the years 1939-1959. The increased drilling activity after 1940 reflects entry of major companies into the state. Wildcatters have been drilling on a small scale for oil in Oregon since the turn of the century, but none has been successful in finding any oil or gas.

Geologic picture. All wells that have penetrated more than 5,000 ft. of section in Oregon are plotted on the accompanying map of the state. The map shows the extent of the major rock areas in Oregon and the relationship of exploration to these areas. Tertiary marine sediments occupy a wide strip along the western coastal region, while Mesozoic-Paleozoic rocks are exposed in large portions of southwestern, Central, and East Oregon. The rest of the state is buried under a complex mantle of volcanic material and stream and lake deposits of Cenozoic age. It is believed that a considerable area of Mesozoic-Paleozoic marine formations lies beneath these younger nonmarine rocks in central and eastern Oregon. Unfortunately, no tool other than the drill has been devised by which the structural deformation and areal extent of these buried formations can be accurately determined. It will take costly deep wells to adequately explore this region.

The oil outlook. About one-fourth of Oregon's 95,607 sq. miles can be considered at least a favorable place to look for oil and gas.

The need for more oil and gas reserves and a decreasing number of prospective areas in the United States provide the economic conditions necessary for a greater exploration and development effort in all wildcat areas.

Success marks Texas drilling

Texas confirmation test shows oil

FIRST CONFIRMATION try to a new pool opener in Menard County, southwestern Texas, had a slight oil show in an unidentified zone. This well is J. R. McLean 2 Alex Menzies, a confirmation test to the new Canyon discovery 14 miles northwest of Menard in the northwestern part of the county.

A drill-stem test at 2,148-65 ft. recovered 15 ft. mud with a rainbow showing of oil. This well is in Section 60, J. Hughes Survey. It is 933 ft. northeast of the 1 Menzies which was completed flowing 123 bbl. of 36°-gravity oil per day from Canyon perforations at 3,198-3,204 ft. Nearest comparable production to new Wilhelm Lane Canyon field is 35 miles northwest in Yan-Kee field, separated by dry holes. Nearest oil is 8 miles southwest at Southwest Camar Strawn field. There is very little production in this part of Texas, and the new field could well stir up new interest in the Edwards Plateau country, one of the last wildcat frontiers in the state.

North Millard field adds fourth producer

West Texas' North Millard Queen sand field in Crockett County, 5 miles south of Iraan, gained its fourth producer at John I. Moore 1-64 Halff-Bivins, Section 64, Block 1, I&GN Survey.

The new well flowed 117 bbl. of 30.6°-gravity oil daily on ¼-in. choke from perforations at 1,328-42 and 1,344-52 ft. in Queen sand.

Oil reported on test at Pecos project

An eastern Pecos County wildcat in West Texas reportedly had shows during drill-stem tests. It is Midwest Oil Corp. 1 University, 25 miles east of Fort Stockton on the east side of Delaware basin.

A test in an unnamed zone at 6,692-6,730 ft. recovered 3,400 ft. of 40°-gravity oil plus 200 ft. of heavily gas-cut mud. Top of Waddell sand was at 6,642 ft. An earlier test in Wolfcamp Permian at 5,302-34 ft. had 400 ft. of oil and gas-cut mud, 760 ft. of 38.4°-gravity oil and 30 ft. salt water. This prospective discovery is in Section 6, Block 20, University Lands Survey, 1½ miles south of South Girvin field.

Clear Fork pays at West Texas discovery

New production from lower Clear Fork sand is reported in western Ector County, West Texas. Discovery well is Diversa, Inc., et al 1-A J. D. Amburgey, 1¾ miles south of Wheeler field and 1 mile northwest of a dry hole in Section 3, Block B-8, PSL Survey.

The well pumped 186 bbl. of 35°-gravity oil per day from perforations between 6,383 and 6,553 ft.

Spraberry oiler reported in Reagan County, Texas

Spraberry production was reported at a wildcat 13 miles north of Big Lake in the Stiles field area of Reagan County, West Texas. The discovery well is Beal, Trobaugh & Associates 1 Crews, a reworked 10,290-ft. old hole in Section 9, GC&SF Survey, 4½ miles southeast of Spraberry Trend.

The well pumped 213 bbl. of oil plus 60% water per day on potential test. Perforations are at 5,694-5,706 and 6,584-92 ft. in upper and lower Spraberry sand.

Atoka is new North Texas area producer

Atoka Pennsylvanian oil production was opened in Boonsville Bend Conglomerate gas field, Wise County, North Texas, at Christie, Mitchell & Mitchell 1 Olis Meek, A. Robinson Survey, A-706. This new pay discovery is 3 miles southeast of Bridgeport, Tex.

The well flowed 121 bbl. of oil daily from perforations in Atoka at 5,099-5,109 ft. Flow was through

14/64-in. choke. The well also had 1,370 M.c.f.d. from Bend conglomerate regular area pay. The new field will be called Meeks 5,100-ft. Atoka.

San Emidio Nose test completed in California

Richfield Oil Corp. recently completed an extension test on the southwest edge of the San Emidio Nose Field for 307 bbl. daily of 30.6°-gravity crude through a 14/64-in. choke. The well, 25-9 KCL H, was perforated at 11,481-11,561 ft. It is located in NW SW 9-11n-21w.

Mountain View find put on the pump

Verde Enterprises, operators for Ancora Corp., put its new pool discovery 1 mile south of the Mountain View field in Kern County on the pump making 99.3 bbl. daily of 33°-gravity crude from perforations at 9,086-9,194 ft. The well is in SE SE 34-31s-29e.

Two wildcats staked out in California Glenn

As soon as weather permits, two operators were prepared to move on locations in Glenn County's gas areas.

Eddie Fisher announced plans to drill a 3,750-ft. test about 3¼-miles north of the Perkins Lake field in the Ord Bend region.

Peacock Oil Co. will drill a wildcat a little south of General Petroleum Corp.'s Rancho Capay gas discovery of last year.

American firm slates Canada gas drilling

THE natural-gas-producing industry in Alberta holds promise of a bright future and Zapata Petroleum Corp. wants to be part of this industry with a direct and working interest in its exploration and development.

An agreement completed recently between this American independent operator and British American Oil Co., Ltd., has moved Zapata into a contending position, and its place in this huge potential industry will depend to a large degree on its exploration successes within the next couple of years.

The company has acquired, under farmout agreement, a spread of some 200,000 acres of petroleum and natural-gas lease rights situated in the central sector of the province of Alberta. These lands are considered by Zapata to be favorably located for the discovery and production of natural gas. To prove its point, the firm is expected to start work on initial drilling projects soon. Its exploration program, and it is to be hoped, follow-up development drilling operations, will extend over at least the next 2 years.

Complete details on the farmout deal have not yet been reported. However, it is understood that as many as 30 exploratory tests may be put down in the project. Each wildcat well drilled within the confines of the large land spread will earn the company interests in specific lands, and a continuous drilling program is contemplated.

Bulk of the acreage involved in the agreement is Canadian Pacific Railway lease rights that are presently held by British American. Also included, however, are some Freehold and Crown leases which British American has under lease arrangement. The most southwestern portion of the acreage involved is close to the town of Stettler, about 100 miles north-northeast of the city of Calgary. From Stettler the lands extend east some 30 miles, northeast almost 40 miles and north-northeast nearer to 50 miles. By townships and range, included are some rights in Township 30, Ranges 18 and 19w4; Townships 40 to 42, Ranges 15 to 19w4; Townships 43, 44, 45, and 46, Range 17w4; and Townships 45 and 46, Range 18w4.

The limited amount of exploration carried out in the general area has turned up a number of natural-gas finds, as well as some small oil prospects. Although not officially reported by Zapata, it is understood that the drilling program will be aimed at the discovery and development of gas reserves.

The irregular-shaped land block encompassed by the farmout deal includes lands lying close to gas production in the Leahurst gas field that is just 3 miles east of Stettler. The pair of gas completions in this defined field are already tied to a domestic gas market. Like the Leahurst field, the Sunray Red Willow gas discovery is situated in the southwestern sector of the farmout area. In the south sector of the 23 township spread, Canadian Homestead Oils has a gas-discovery well and British American drilled its Dhemin gas find. About 16 miles north of Stettler lies British American's Damburger gas strike and another 6½ miles north of that gasser is the company's Gulf Dennis gas-discovery well. Over in the northeast corner of the spread, British American drilled the Congdon gas find. A total of 46 wells have been drilled in the townships named in the Zapata-B. A.

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deal and almost one-third of these tests gave indication of commercial gas production.

Main geological prospects for gas production in this general area lie in the Cretaceous zones, including the Viking sand, Glauconitic, Ostracods, Basal Quartz sections, as well as the Mississippian and the Devonian zones. Leahurst, for example, is a Lower Cretaceous gas field, the Red Willow well found its gas in the Basal Quartz, Dhemin in the Blairmore, Damburger in the Viking, Dennis in the Mississippian, and Congdon in the Blairmore.

The lands that will be closely explored by Zapata are within 15 miles of the Nevis junction of the Alberta Gas Trunk Line Co., while the Provost spur line is less than 60 miles east and slightly south of the southeastern corner of this Alberta land spread.

Zapata's latest move will likely prove reassuring to a number of companies that are anxiously awaiting news on gas-export applications. For its exploration project that will be started in the very near future with a reported four-well drilling program will ultimately result in the expenditure of many hundreds of thousands of dollars.

Well tested in Kentucky's Lawrence

In southern Lawrence County, Adams Quadrangle, R. H. Adkins is cleaning out after shooting Berea sand at his 1 Thompson. Well had previously been carried to a total depth of 3,262 ft. in the Clinton (Lower Silurian) formation. Formation tops released to date include: Mississippian Big lime 723 ft., Berea 1,309 ft., Corniferous lime 2,068 ft., Big Six sand 2,795 ft., and Clinton at 3,152 ft.

Off-trend Michigan well paying off

AN OFF-TREND location ¾ mile from established Trenton-Black River oil development in Pulaski field, Jackson County, is paying off.

Don Davis 1 Peterson, NW NE SE 17-4s-3w, flowed 500 bbl. oil in 21 hours on 15/64-in. choke at four-shot perforation point of 1-ft., 4,127-28 ft. Production is from Black River section and just below loss zone that took all mud at 4,110 ft. Trenton top was at 3,720 ft.

Operators immediately speculated whether the Davis well would establish a new parallel trend to Pulaski-Scipio.

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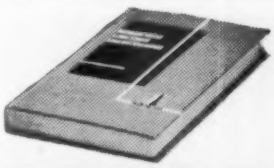

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• Sunray Mid-Continent 1 Bollaert, C NW SW 33-6n-13e, Berlin Township, St. Clair County, following 7 to 9 bbl. oil per hour natural from Niagaran at 3,800-25 ft., is expected to revive both field drilling and exploratory work in southeastern Michigan. Sunray surveyed two offsets to the reef discovery. Test logged Niagaran at 3,596 ft. and cored reef with oil saturation in an 80-ft. interval.

Denver basin activity continues brisk pace

In Morrill County, Western Nebraska, Ohio Oil Co. and Kinney-Coastal Oil Co. opened a new field at 2 Dunlap in C SW NE 32-20n-51w. The well pumped 209 bbl. of oil per day from perforations in the "D" Dakota Cretaceous sand at 4,120-23 ft. This new pool is 5½ miles northeast of nearest production at Craig in a new area for future exploration in the Denver basin. The west offset to the new pool opener was dry.

In Washington County, eastern Colorado, B. F. Allison completed 1 Pan American-State in NE SW 33-3n-54w, 2¼ miles northwest of West Xenia field. The well flowed 4,200 M.c.f.d. from 24/64-in. choke from "J" sand Dakota Cretaceous perforations at 4,781-83 ft. Nebraska fields. A new-pay discovery for Ackman field in Red Willow County is Frontier Refining Co.'s 2 Reiners in C SE SW 14-2n-28w. The well pumped 160 bbl. of oil plus 5% water per day from perforations in two Pennsylvanian zones—the Oread at 3,177-79 ft., and 3,277-87 and 3,311-21 ft. in Lansing-Kansas City, the regular field pay. Oread lies above the Lansing-Kansas City. This new well is a south offset to the 1959 field discovery well in the new Kan-Neb basin.

In the Denver basin, Sunburst Petroleum Co. confirmed a new field in Kimball County at 1 Evertson, C SW NE 12-16n-57w. The well pumped 210 bbl. of oil per day from four sets of "J" sand perforations between 6,710 and 6,742 ft. The confirmation discovery is an east offset to the 1959 discovery in C SE NW 12-16n-57w, drilled by Enbrook Oil & Gas Co. That well pumped 152 bbl. per day from "J" sand. Drilling is still going at west, north, and northeast offsets.

Big Dakota discovery reported in Nebraska

A 60-bbl. per hour oil discovery is reported at Wyoming Western Oil Co. et al. 1 Hoffman in C SE SE 19-14n-57w, Kimball County, western Nebraska. This new Denver basin strike swabbed oil at hourly rates of 50-60 bbl. from "J" sand at 6,996-7,006 ft. Location of the new pool is 1 mile southwest of Hoffman field, separated by a dry hole. In Banner County, Edward Mike Davis completed 1 Patton in C SW SW 17-18n-57w for 187 bbl. of oil per day from "J" sand perforations at 6,755-59 ft. This new field is 1¼ miles northwest of Vogt field.

Offsets slated for San Juan basin

TWO OFFSET WELLS have been staked near the new remote Niobrara Cretaceous discovery in the eastern part of northwestern New Mexico's San Juan basin.

Intex Oil Co. will drill 2 Alto in NE NE 5-26s-1e, Rio Arriba County, and the 1 Alto Eturriga in SE NE 5. Both are planned as 2,800-ft. tests of the Greenhorn Cretaceous lime.

Intex is setting casing at about 680 ft. at the 1 USL Bajo, wildcat 1⅜ miles southeast of its Niobrara discovery in SE NW 9.

This discovery created quite a stir in San Juan basin oil circles several weeks ago. It was completed pumping and flowing 128 bbl. of oil per day from Niobrara. Location is in NW

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NE 5-26n-1e. Stratigraphy of the 1 Alto is thus: 0-368 Lewis, 368-824 Mesaverde, 842-1,765 Mancos, 1,765-1,958 Niobrara.

Abo grows with new extensions

SOUTHEAST New Mexico's Abo trend continues to grow. The Eddy County field was extended west at Humble Oil & Refining Co.'s Chalk Bluff Draw Unit. The well cut 400 ft. of pay. The 1 Abo-Unit finaled flowing 129 bbl. of 44°-gravity oil per day on ⅞-in. choke from Abo pay. This well is in NE SW 9-18s-27e. Humble is also busy at the No. 2 well, a north offset, and has staked the No. 3 well as a south offset. This unit has been offset half a dozen times on the east side.

Pan American Petroleum Corp. completed a northeast outpost well at the east side of Abo trend flowing 86 bbl. per day on 5/64-in. choke. The well is the 1-BG State in SW SE 32-17s-28e. It lies about ½ mile northeast of other recent extension discoveries. This Pan Am well is 5½ miles east of Humble's Chalk Bluff Draw discovery.

Hondo - Western - Yates completed 1-A State in SW NE 6-18s-28e for 186 bbl. of oil per day on 12/64-in. choke. This is the company's first well on the trend.

Third completion reported in Ohio's Muskingum

In Ohio Brendel Producing Co.'s third completion in its play in southwest Falls Township, Muskingum County, was reported as having a flow of 125 bbl. of oil with 500 M.c.f.d.

The 1 V. Phillips, Lot 7-3 Qt., gaged 35 M.c.f.d. with a show of oil natural. The Clinton sand was logged at 3,533-77 ft. and was fractured with 550 bbl. of oil and 18,000 lb. of sand.

Deep test. Roy Stewart is abandoning 1 Kenneth Mosher, Section 2, Lake Township, Ashland County, at a depth of 5,485 ft. No shows were indicated in the Glenwood at 5,206-63 ft. or in the Cambro-Ordovician which was topped at 5,263 ft.

Ohio's Ashtabula has another hit

ANOTHER STRIKE in the Oriskany sand in Ashtabula County in Northeast Ohio is reported.

Felmont Oil Corp. and Sun Oil Co., scheduled Clinton test, 1 M. Hudson, Lot 22, Pierpont Township, found Oriskany production of 2,500 M.c.f.d. in 5 ft. of pay from 2,356-61 ft. Rock pressure of 975 psi. was recorded.

Location is approximately 9 miles south of the big Clinton gas play in Monroe Township.

• Wiser Oil Co. announced Newburg reef production was found in a ½-mile stepout east of Tiverton Center Clinton pool.

Their 1 F. M. Cooper, Section 10, Tiverton Township, Coshocton County, logged the Newburg sand at 2,554-65 ft. Natural gage was 188 M.c.f.d. with rock pressure of 805 psi. and 819 M.c.f.d. with 1,055-psi. rock pressure after acid treatment.

The nearest Newburg production is about 8 miles north in Richland Township, Holmes County.

Oil comes to Sooner gas pool in Harper

Morrow Pennsylvanian oil production was established inside Northwest May gas field in Harper County, northwestern Oklahoma. Discovery well is Pan American Petroleum Corp. 5 Catesby Operating Unit in C SE NW 28-25n-24w.

The Morrow oiler flowed 491 bbl.

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FREE SPIRAL PISTON—Pushing the oil to the surface, it spins the trailing end of the fluid slug. This forms an interface to eliminate fluid slippage—bring more oil to the surface. It minimizes gas cutting through to the fluid—provides reduced gas/oil ratios with less gas-injection pressures.

It's simple to install and PROVEN through years of service. For details and prices, write for Sunshine's complete catalog. Ask for the SIW Dual-Purpose Whirling Rabbit through your favorite supply store.

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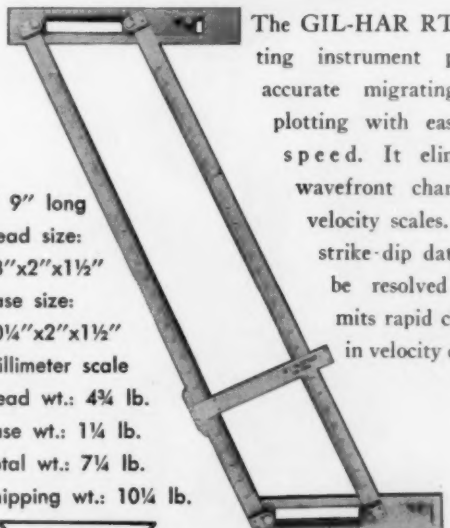
Manufacturers of a complete line of paraffin-control equipment and oilfield specialties

RESOLVED TIME PLOTTER



The GIL-HAR RT Plotting instrument permits accurate migrating and plotting with ease and speed. It eliminates wavefront chart and velocity scales. More strike-dip data may be resolved; permits rapid changes in velocity curves.

2' 9" long
Head size:
13"x2"x1½"
Base size:
10¼"x2"x1½"
Millimeter scale
Head wt.: 4¾ lb.
Base wt.: 1¼ lb.
Total wt.: 7¼ lb.
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of new oil in 31 hours from perforations at 7,318-20 and 7,304-26 ft.

In Beaver. Morrow sand at 7,043-58 ft. flowed 11 M.M.c.f.d. and 2 bbl. condensate per million on 1-point test at Oklahoma Natural Gas Co. 1 Kenneck in C NW SE 17-3n-24eCM, Beaver County.

Texas County. Two geological discoveries were reported inside Guymon-Hugoton field in Texas County, Oklahoma Panhandle.

Shell Oil Co. finaled 1-20 Fisher in C NW SE 20-4n-16eCM for 7,400 M.c.f.d. and 4.6 bbl. condensate per million open flow from Keyes Pennsylvanian sand at 6,555-66 ft. and 6,606-18 ft.

Hamilton Bros. 1-16 Dailey, C SE NW 16-5n-15eCM, is an upper Morrow Pennsylvanian discovery at 6,120-30 and 6,140-58 ft. It flowed 11,800 M.c.f.d. with 2½ bbl. condensate per million.

Oklahoma's East Clark Creek field growing

Another multipay field is building up in northwestern Oklahoma's Harper County. Sinclair Oil & Gas Co. opened East Clark Creek field not far from the Kansas line last year at 1 H. E. Rohrer in C SE SW 20-29n-22w. Flow as 7,592 M.c.f.d. and 18 bbl. condensate in 12 hours on 22/64-in. choke from Morrow Pennsylvanian at 5,701-11 ft.

The 1 A. L. Buzzard, a new producer, has confirmed Morrow gas production and discovered Hoover oil production for the field. The 1 Yauk is waiting on orders at 5,974 ft., total depth.

Pennsylvania activity continues brisk pace

A new field was opened in Fayette County on the Laurel Hill anticline. The discovery well is Manufacturers Light & Heat Co. 1 Meuller-Herr. Gas was found in the Onondaga chert. The Onondaga lime was logged at 6,825 ft., chert at 6,841 ft. The Oriskany sand was found at 7,009 ft. After fracture, the well made 4,500 M.c.f.d., with rock pressure, after being shut in for 15 hours, of 3,450 psi. A confirmation well was completed by the same company on the Bertha and E. G. Mueller farm. After fracture the well made 637 M.c.f.d.

Farther north on this same anticline, the same operator completed an Onondaga chert test on the C. M. Stone farm, finding the chert dry. A fourth well is located near the Stone well on the State Game Tract 111-A. This one had a show of gas, 108 M.c.f.d., in the Onondaga chert, and is being fractured.

- The 1 Borst well in Erie County, the first potential producer in the state from Gatesburg Cambrian, is still undergoing tests and will be fractured.
- The Frank Kapp well by Berry & Johnston in Warren County found 300 M.c.f.d. in the Red Medina Lower Silurian. This well is to be fractured. At present there are 264 ft. of pipe in the hole and fishing job is under way.
- Boone Mountain pool in northwestern Clearfield County has seen extensive development during the past year. Recently, a 3-mile stepout to the southwest of the current drilling found considerable gas in the Oriskany. This caused a flurry of new locations between this well and proven production, and also to the southwest of the stepout. At present there are 16 wells drilling on this trend.
- North of Sunbury, a well is being drilled in Northumberland County. The target for this remote wildcat is the Oriskany sand. Drilling is at 3,003 ft.

Wyoming's State Line field adds new pay

Fort Union Tertiary oil was added to State Line Unit field in Sweetwater County, southwestern Wyoming.

Gulf Oil Corp. completed 3 State Line Unit in SW NW 18-12n-94w on the west side of the gas field for 450 bbl. of oil daily flowing from perforations at 3,934-45 ft. There are two other wells in the field, both of them Tertiary gas producers. The field lies on the state line between Colorado and Wyoming in the southern portion of the Red Desert basin.

New book released by Northwest Oil Report

Northwest Oil Report, 3437 S.E. Francis Street, Portland, Ore., has released an annual report on last year's exploration activities in Oregon and Washington. This report gives the highlights of 1959 drilling in the Pacific Northwest, leasing, pipelines, and the outlook for 1960. It is well supplied with exploratory and drilling data of last year's work in the Northwest.

Excellent Rockies map released by Allstate

Allstate Map Makers, 1219 W. T. Waggoner Building, Fort Worth, have completed two new maps of the Rocky Mountain region from northern New Mexico to the Canadian border. One of the maps contains over 1,100 fields correctly delineated and named, while the 1959 discovery map indicates the operator, pay zone, and depth for each of the 285 discoveries in the region last year. The maps are in three colors, fine for wall work, and on convenient scale.

Discovery wells

ARKANSAS

Lafayette County:
George Belchic, Jr., and Exploration Associates, Ltd., 3 Scantland, 12-16s-24w. IPP 81 BOPD, 17°, GOR 200 cu. ft. per bbl., perf. 3,079-85 ft., Paluxy. TD 3,413 ft. New pay in Sunview field.

WESTERN CANADA

Alberta:
Pan American K-1 6-22 Birch Lake, LSD 6, 22-59-12w4. Viking gas discovery. TD 2,600 ft.

British Columbia:
Union-Hudson's Bay D-74-H East Woodrush, 74-H-94-H-2. Potential Triassic oil discovery. TD 3,715 ft.
Gulf States C-78-I (3) Fort Nelson, 78-I-94-J-10. Slave Point gas discovery. TD 6,533 ft.
Gulf States B-1-D Petitot River, 1-D-94-P-13. Slave Point gas discovery. TD 6,628 ft.

ILLINOIS

Crawford County:
Richland Oil Corp. 1 S. Richey, SW NE NE 24-6n-11w. IP 1,500 M.c.f.d., Penn. sand 612-21 ft. TD 621 ft. New gas field.

Randolph County:
E. E. Rue 1 Koenig - Preston - Wegener Comm., SE NW SW 10-4s-7w. IP 200 M.c.f.d., Cypress 236-70 ft. TD 275 ft. New gas field.

INDIANA

Gibson County:
Dee Drilling Co. 1 August Hawes, SW SE SW 16-3s-9w. IP 100 BOPD, Cypress 1,585-93 ft. TD 1,930 ft. Opens Wheatonville Consolidated field.

KANSAS

Barton County:
Wilkinson Drilling Co. 1 Wondra, SE SE SW 10-17s-12w. IP 174 BOPD, 39.5°, Arbuckle 3,310-23 ft. TD 3,323 ft. Opens North Wondra field.
Dunn-Gardner Drilling Co. 1 Stoutt, NE NE NE 23-18s-11w. IP 32 BOPD, 31.5°, Arbuckle 3,301-05 ft. TD 3,340 ft. Opens Northwest Meadowside field.

Cheyenne County:
R. G. Lawton 1-A Catherine Leibbrandt, C NW NE 36-3s-42w. IP 95 BOPD, 23°, Lansing-Kansas City 4,503-10 ft. TD 5,300 ft. New field. South Rueb.

Decatur County:
K&E Drilling Co. 1 Anderson, NE SE SW 29-5s-29w. IP 105 BOPD, 35.5°, Lansing-Kansas City 4,034-39 ft. TD 4,410 ft. Opens Prairie Dog field.

Ellis County:
Alpine Oil & Royalty Co. 1 Windhol, NE NE NW 18-13s-16w. IP 91 BOPD, 35°, Lansing-Kansas City 3,343-48 ft. TD 3,578 ft. Opens Holz field.

Graham County:
Murfin Drilling Co. et al. 1 Herman, C SW NW 9-10s-24w. IP 85 BOPD, 36°, Lansing-Kansas City 3,999-4,080 ft. TD 4,080 ft. Opens Bryan field.

January completion report

TOTAL COMPLETIONS

	Total	Crude	Cond.	Gas	Dry	Service	Footage
Alabama	5	5	0	0	0	0	41,456
Alaska	1	0	0	0	1	0	11,774
Arizona	6	0	0	0	6	0	9,598
Arkansas	52	25	0	4	23	0	189,003
California	137	85	0	11	37	4	631,614
Colorado	65	10	1	12	42	0	354,556
Florida	1	0	0	0	1	0	6,437
Illinois	213	78	0	3	102	30	457,575
Indiana	90	37	0	0	53	0	138,837
Kansas	310	146	0	11	146	7	1,089,858
Kentucky	209	150	0	18	37	4	198,868
Louisiana	323	146	36	20	119	2	2,623,611
North	110	59	0	12	39	0	385,262
South	161	56	37	7	66	2	1,719,450
Offshore	52	31	6	1	14	0	518,899
Michigan	49	18	0	1	30	0	165,234
Mississippi	69	31	4	1	32	1	697,323
Montana	32	12	0	1	19	0	137,969
Nebraska	68	21	0	0	47	0	400,310
New Mexico	190	111	10	26	42	1	856,792
West	67	23	8	26	9	1	288,668
East	123	88	2	0	33	0	568,124
New York	25	13	0	1	2	9	37,416
North Dakota	27	14	1	0	12	0	183,215
Ohio	126	49	0	36	19	22	309,013
Oklahoma	346	152	16	35	140	3	1,478,883
Oregon	1	0	0	0	1	0	2,627
Pennsylvania	67	17	0	29	8	13	208,611
South Dakota	2	0	0	0	2	0	9,571
Texas	1,629	805	93	79	623	29	7,343,873
Dist. 1	118	47	5	6	60	0	341,885
Dist. 2	69	19	11	10	20	0	469,337
Dist. 3	144	56	28	7	53	0	1,000,881
Dist. 4	153	29	26	20	78	0	821,878
East (5 & 6)	137	69	7	1	60	0	709,483
Dist. 7-B	198	87	2	4	105	0	563,962
West (7-C & 8)	475	330	6	12	127	0	2,391,852
Dist. 9	259	115	3	9	103	29	678,334
Dist. 10	76	53	5	10	8	0	366,261
Utah	25	8	0	5	12	0	131,292
Washington	1	0	0	0	1	0	8,520
West Virginia	62	1	0	46	7	8	178,110
Wyoming	92	37	0	8	46	1	460,697
Total Jan. 1960	**4,223**	**1,971**	**161**	**347**	**1,610**	**134**	**18,362,643**
Total Jan. 1959	**4,654**	**2,303**	**124**	**314**	**1,801**	**112**	**19,724,104**

WILDCAT WELLS

	Total	Crude	Cond.	Gas	Dry	Footage	C.T.	D.D.	Act. op.
Alabama	0	0	0	0	0	0	0	0	5
Alaska	0	0	0	0	0	0	0	0	5
Arizona	6	0	0	0	6	9,598	0	0	7
Arkansas	14	0	0	1	13	46,933	0	0	84
California	34	3	0	3	28	185,659	2	0	70
Colorado	34	2	0	4	28	190,113	0	0	100
Florida	1	0	0	0	1	6,437	0	0	1
Illinois	52	5	0	0	47	91,778	23	0	393
Indiana	30	0	0	0	30	41,583	61	0	116
Kansas	96	16	0	0	80	363,375	21	2	356
Kentucky	25	2	0	0	23	37,119	111	0	126
Louisiana	44	2	0	3	39	374,653	0	0	365
North	19	1	0	2	16	83,296	0	0	108
South	24	1	0	1	22	279,357	0	0	206
Offshore	1	0	0	0	1	12,000	0	0	51
Michigan	19	0	0	0	19	70,303	32	0	148
Mississippi	24	3	0	0	21	249,856	0	0	70
Montana	16	1	0	1	14	65,344	2	0	31
Nebraska	25	7	0	0	18	146,337	0	0	47
New Mexico	28	2	0	0	26	125,209	41	0	168
West	6	0	0	0	6	15,507	13	0	79
East	22	2	0	0	20	109,702	28	0	89
New York	2	0	0	0	2	4,806	25	0	11
North Dakota	5	0	0	0	5	23,071	0	0	40
Ohio	4	2	0	0	2	19,017	124	0	197
Oklahoma	74	7	4	7	56	367,411	32	6	687
Oregon	1	0	0	0	1	2,627	0	0	0
Pennsylvania	3	0	0	1	2	21,494	56	10	79
South Dakota	2	0	0	0	2	9,571	0	0	7
Texas	356	19	8	7	322	1,604,849	87	12	1,047
Dist. 1	45	0	0	0	43	139,755	0	1	41
Dist. 2	18	1	1	1	15	124,520	0	3	57
Dist. 3	26	2	2	0	22	235,541	0	2	81
Dist. 4	41	0	4	3	34	203,252	6	6	82
East (5 & 6)	35	2	1	0	32	209,782	0	0	66
Dist. 7-B	59	7	0	2	50	204,161	0	0	90
West (7-C & 8)	78	2	0	0	76	279,467	35	0	384
Dist. 9	49	3	0	1	45	168,670	46	0	120
Dist. 10	5	0	0	0	5	39,701	0	0	126
Utah	11	1	0	0	10	52,760	0	0	52
Washington	1	0	0	0	1	8,520	0	0	1
West Virginia	1	0	0	0	1	7,268	60	0	191
Wyoming	43	6	0	0	37	230,331	4	0	143
Total Jan. 1960	**951**	**78**	**12**	**27**	**834**	**4,356,022**	**681**	**30**	**4,544**
Total Jan. 1959	**963**	**88**	**13**	**31**	**831**	**4,853,011**	...	...	...

. . . and in Canada

	All wells					Wildcats				
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage
Alberta	169	109	19	41	1,009,517	**46**	8	9	29	258,612
Saskatchewan	44	29	0	15	184,971	**14**	1	0	13	68,295
Manitoba	7	5	0	2	16,922	2	0	0	2	6,475
British Columbia	12	4	3	5	54,339	4	2	0	2	16,284
Western Canada	**232**	**147**	**22**	**63**	**1,265,749**	**66**	**11**	**9**	**46**	**349,666**
Ontario	16	2	5	9	23,126	....	....	....	....	.....

Kingman County:
Drillers Producing Co. 1 Garnett, NE NE SW 35-28s-6w. IP 4,500 M.c.f.d., Miss. 3,928-35 ft. TD 4,333 ft. Opens Dale field.

Marion County:
Francis Haun 1 Siebert, NE NE NW 17-19s-3e. IP 2 M.M.c.f.d., 2,420-44 ft. TD 2,444 ft. Opens East Hillsboro field.

Sheridan County:
Empire Drilling Co. 1 Currey, NE NE SW 30-7s-29w. IP 140 BOPD, 28°, Lansing-Kansas City 3,971-77 ft. TD 4,205 ft. Opens Parnell field.

Kimbark Oil Co. 1 Von Lintel, SW SW NE 2-10s-26w. IP 91 BOPD, 42°, Lansing-Kansas City 3,983-86 ft. TD 4,325 ft. Opens Northwest Custer field.

Stafford County:
National Drilling Co. 1 Hartnett, NE NE SE 34-23s-12w. IP 271 BOPD, 34°, Lansing-Kansas City 3,538-44 ft. TD 3,890 ft. Opens West Kelly field.

Sumner County:
Lario Oil & Gas Co. 1 Rusk "B," NE SW NE 8-32s-1e. IP 75 BOPD, 42°, Simpson 4,010-20 ft. TD 4,200 ft. Opens Rusk field.

Thomas County:
Musgrove Petroleum Corp. and John O. Farmer 1 Brown, C SW NE 12-6s-35w. IP 211 BOPD, Wabaunsee 3,739-43 ft. TD ? New field.

MISSISSIPPI

Franklin County:
Miss-La-Tex Oil & Gas Corp. et al. 1 U.S.A., 36-5n-1e. IP 128 BOPD, 9/64-in., 31°, TP 400 psi., GOR 200 cu. ft. per bbl., perf. 4,824-26 ft., Wilcox. TD 11,206 ft. Elev. 225 ft., Wilcox 4,598

(Continued on page 157)

Cooperation Is a Key Word

. . . to Humble's new employe-relations chief. He reasons both management and labor benefit by working together.

A FEW skeptics raised their eyebrows when Dr. David F. Edwards was made manager of employe relations for the new Humble Oil & Refining Co.

They couldn't quite see how the manager of a refinery—and one of the company's smallest refineries, at that—could do a good job as manager of employe relations for a company with 41,900 employes.

But, those who know Dave Edwards haven't the slightest doubt that he will handle the job capably. They base their conviction on their knowledge of the man and on what he has done.

In picking Edwards for the post, Humble departed from the general concept of a top management executive. He's determined but he's not dynamic, aggressive, nor overpowering. His easy appearance, his soft-spoken manner, and some of his ideas differ from those usually associated with men in such positions.

Here are some of these ideas as he expresses them:

. . . Policy. "Because of our decentralized organization, refineries generally do their own bargaining. You have all the problems in a refinery you have in a company. As manager I will be doing pretty much the same, but less directly. Now it will be by suggestion and advice. I don't see myself as setting a company policy but rather developing a policy. We are working on such a plan."

. . . Today's problem. "Changes are going on today. Foreign competition is a real factor . . . Industry can no longer pass on to the customer increased costs just as a result of wage increases or inefficiencies.

"We must improve our efficiency, and it can be done through the cooperation of labor and management. It

Dr. David F. Edwards
. . . moves up Humble ladder.

not only means improved efficiency for the company, but it will enable it to keep ahead and, at the same time, offer greater employe opportunities."

. . . Unions. "A strong union is one that management listens to. It is a tool for management to use to do a better job. A well-informed union is essential to good operation, it is one that understands what is needed to meet today's conditions.

"Obstinate unions are due to a lack of understanding which, in turn, is due to poor communications. You have to plan discussions with employes about business. It is important for them to know customer reactions. I make it a point, when possible, to have important customers talk to our union."

"Interests of the company and employes are the same. Employes realize this too if given the opportunity."

. . . Cooperation. "Management must cooperate with union leaders to get people to understand the moves made by the union. I can cite dozens of examples where the union has helped us run a better business. A union is important and necessary, and it can make a real contribution."

. . . Politics. "I don't like to talk about our people being active in politics. I think they should be active in community affairs where they make a contribution to the community. Holding office is fine, but I like to look at it more from the standpoint of service to the community."

Edwards' attitude on business men in politics is exemplified by a personal experience in Bayonne. When he was named plant manager, both the city of Bayonne and the Bayonne refinery faced a tax crisis.

The city tax rate was scheduled to go up about $12. It would mean another $300,000 in taxes for the refinery. It was already paying almost $3,000,000 a year in taxes.

The added tax could be the straw that would break the camel's back. Edwards, with characteristic directness, went to the city fathers and laid his problem before them.

He told them that Esso at least would have to give up a modernization program then under way and might have to close the refinery. The results were positive: Bayonne not only canceled the proposed tax increase but cut the tax 10%.

Edwards made his contribution to the community by helping to make the tax cut possible. He spearheaded the establishment of the Bayonne Economic Research Council to study the Bayonne city government and recommend methods of reducing costs without curbing services.

Sours on sugar . . . Edwards earned his bachelor's and master's degrees at Louisiana State University. His first interest was in sugar engineering.

The long layoffs between sugar crops and the need to move with the harvest season discouraged him and he turned to industrial chemistry. He went to Pittsburgh seeking a fellow-

▶▶▶ Personals

K. F. Hitchcock, gas engineer for Texaco Inc. in Houston, has been promoted to assistant superintendent in New Orleans.

Dr. I. Harold Silberberg, formerly with Socony Mobil Oil Co.'s Dallas research laboratories, has been named assistant director of the University of Texas division of the Texas Petroleum Research Committee. He also will be an assistant professor of petroleum engineering.

F. C. Aldrich, manager of Ohio Oil Co.'s Sidney, Neb., production district, has been named manager of the company's new international oil sales department. He will headquarter in London.

A. J. Evans, Jr., area production manager for Gulf Oil Corp., has been transferred to Crane, Tex., from Abilene, Tex.

Frank B. Carter, senior administrative geologist in General Petroleum Corp.'s exploration department before merger of General Petroleum and Mobil Oil Co., has retired. Carter joined General Petroleum in 1934.

ship at Mellon Institute. He taught chemistry at the University of Pittsburgh, working toward his doctor's degree at the same time.

In 1926, he went to work for Hope Construction & Refining Co., a subsidiary of Standard Oil Co. (N.J.).

Edwards got his first look at Bayonne in 1929. He had been transferred to the technical service division and was part of a team assigned to start up three new units at Bayonne.

These units were the Para plant, "F" pipe still, and the phenol plant. The Para plant was the beginning of Bayonne's petrochemical operations. It was ultramodern at the time and Edwards could not have imagined then that he would completely reorganize the same refinery a quarter of a century later.

He went to Baton Rouge in 1935 after a short tour in Argentina. At Baton Rouge he started what is now the petroleum technical service division. It acts as a service group for the manufacturing operations and includes the experimental laboratory. He became assistant head of the technical division in 1945 and a year later moved over to manufacturing at Baton Rouge.

By 1953, the Bayonne refinery had become a high-cost, obsolete plant. Dr. Edwards was sent there to determine whether it could be revived as a profit-making operation or should be scrapped. He decided that it could be made profitable if the tax burden was eased and if the plant was modernized.

Edwards, then assistant general superintendent at Bayonne, got the tax situation in hand and set out on a 10-year modernization program. All outmoded equipment was to be replaced and a program of manpower reduction by attrition was set in operation.

He became general superintendent in March 1955 and on January 1, 1957, was made plant manager. His 10-year program still has a few years to go, but it has already accomplished its purpose. The Bayonne refinery is no longer an uncertain quantity. As one official says, "It's here to stay."

W. T. Dolezal, field foreman with Gulf Oil Corp., has been transferred from Abilene, Tex., to Graham, Tex., as production foreman.

James W. Bateman, assistant manager of Continental Oil Co.'s coordinating and planning department, has been promoted to assistant manager of the Lake Charles, La., refinery, a new position.

Thomas C. Landreth, Jr., has been appointed manager of development and production in Honolulu Oil Corp.'s Canadian division. **Jack van Wyke** is Canadian division resident manager for Honolulu.

Kenneth L. Willits, engineer trainee with Big Chief Drilling Co., has been transferred to Oklahoma City from Prentiss, Miss.

Peter C. Petroutson has been elected assistant vice president of Merchants National Bank of Mobile. He has been in the bank's oil department since 1957.

M. D. (Dud) Hughes, consultant, has been appointed director of petroleum and subsidence control for the Long Beach Harbor Department. Hughes was chief petroleum engineer and manager of oil operations for the department before going into consulting work in 1952. He was also with Long Beach Oil Development Co. and Tidewater Oil Co. at one time.

Joseph W. Hecker has been appointed assistant chief engineer of the Louisiana Department of Conservation. Hecker was formerly in charge of the department's permits and production section. He succeeds **Edward Albares,** who has resigned to become director of the Arkansas Oil and Gas Commission. **A. Fred Peterson, Jr.,** will succeed Hecker with the Louisiana department.

R. F. Higginbotham, assistant division production superintendent in Midland, Tex., for Sinclair Oil & Gas Co., has been transferred to Houston in the same capacity. He succeeds **William A. Walther, Jr.,** who recently was named assistant division production superintendent in Tulsa. Higginbotham has been with Sinclair since 1921 and had held the Midland post since 1956.

Frank Gaines, Jr., assistant area production manager in Mattoon, Ill., for Humble Oil & Refining Co., Carter Division, has been promoted to Mattoon area production manager. He succeeds **R. E. Hammond,** who recently was named assistant production manager for the Carter Division in Tulsa. **J. S. Bottler, Jr.,** assistant chief petroleum engineer in the Tulsa headquarters office, will succeed Gaines as assistant area production manager in Mattoon. **J. B. Campbell,** area engineer in Oklahoma City, will succeed Bottler in Tulsa. **Egon H. Rohr,** formerly assistant area engineer, Oklahoma City, will succeed Campbell there.

▶▶▶ Personals

William S. Nordburg, Jr., director of licensing in the research and development department of Standard Oil Co. (Ind.), has been named director of overseas projects for Amoco Chemicals Corp.

Dr. W. H. Hopson, formerly with Pan American Petroleum Corp. in Tulsa, has been transferred to American Oil Co., an affiliate, in Texas City. He will be section head, research section, in the process development laboratories there. **Dr. Isaac Trachtenberg** has been promoted to group leader, research section, for Amoco in Texas City.

R. W. Faulk, manager of Shell Oil Co.'s Norco, La., refinery, has been appointed manufacturing vice president of Shell Oil Co. of Canada, Ltd. The appointment is effective July 1. Faulk will succeed **G. Davidson,** who retires in June after 34 years with Shell. **L. T. Wilson,** manager of Shell of Canada's Montreal refinery, will

FAULK

WILSON

succeed Faulk at Norco. Faulk has been with Shell since 1929. He was manager of the manufacturing department of Shell of Canada in Toronto before moving to Norco as superintendent, operations, in 1953. He became manager there in 1954. Wilson has been with Shell since 1933 and has served in the Martinez, Calif., Norco, and Montreal refineries. He was director of refining and supplies for Shell de Venezuela, Ltd., before becoming manager in Montreal last year.

D. F. J. McIntosh, formerly assistant to Mobil Oil Co.'s superintendent in Taft, Calif., has been transferred to Los Angeles as division analyst in the exploration and producing division there. **I. N. McKenzie, Jr.,** formerly in Taft, has been named drilling and production section head in Los Angeles. **Emmett Forrester, Jr.,** Taft, has been transferred to Santa Fe Springs, Calif., as drilling and production engineer. **A. V. Barnett** has been transferred from Taft to San Ardo, Calif., as production engineer.

Personals

Dr. Robert Price Russell, consultant for W. R. Grace & Co., and **James Jackson Minot,** a director of Grace & Co., have been elected directors of Cosden Petroleum Corp., now a Grace

RUSSELL

MINOT

subsidiary. Russell is president of International Basic Economy Corp. Research Institute and is a former president of Standard Oil Development Co. Minot is senior partner of Paine, Webber, Jackson, & Curtis. Addition of Russell and Minot brings Cosden board membership to nine.

B. L. Francis, petroleum engineer in Houston for Texaco Inc., has been transferred to New York as staff petroleum engineer in the domestic producing department.

L. F. McCollum, president of Continental Oil Co., will receive an honorary doctor of laws degree from Texas Technological College, Lubbock, during the school's commencement exercises this spring. McCollum will be the commencement speaker.

A. C. Stewart, vice president and member of the executive committee of Union Oil Co., and **William C. Kaesche,** executive vice president of Collier Carbon & Chemical Corp., have been elected directors of Collier. **T. C. Henderson,** formerly manager of manufacturing for Collier, has been named vice president in charge of manufacturing operations.

Four citations for service and one API meritorious service award will be presented when the southern district of American Petroleum Institute's Division of Production meets March 16-18 in San Antonio, Tex. Citations for service will go to **C. H. Taylor,** Shell Oil Co., Houston; **Ben F. Carter,** Union Producing Co., Shreveport, La.; **Roy A. Bobo,** Southeastern Drilling Co., formerly in Houston, now in Argentina; and **T. W. Keating,** formerly with Pan American Petroleum Corp., Houston, now of Dallas. **Jack P. Robbins,** Skinner Corp., San Antonio, is recipient of the meritorious service award.

R. D. (Don) Hull has been appointed manager of engineering for Pipe Line Technologists, Inc., Houston. Hull was gas engineer for Sun Oil Co. in Dallas before joining Pipe Line Technologists in 1957.

E. W. Bergquist, Raceland, La., district superintendent for Interstate Oil Pipe Line Co., has been given a rotation assignment as acting chief engineer. He will hold this post for 13-weeks while **George Hughes,** chief engineer, attends Harvard University's advanced management program. **O. B. Denny,** assistant district superintendent in Raceland, will be acting superintendent. **Vernon Cardin,** section head in general engineering, has been named acting assistant district superintendent in Raceland. **R. L. Bullock,** section head in technical services, will temporarily succeed Cardin. **D. C. McKinley,** operations engineer, will take over Bullock's duties in an acting capacity. **Henry Luckett** will be acting operations engineer.

Louis C. Woerndel, formerly chief engineer of United Gas Pipe Line Co.'s Napoleonville, La., compressor station, New Orleans district, has been transferred to the Shreveport, La., district and promoted to chief engineer of the Koran, La., station.

A. L. Repecka, formerly district geologist in Oklahoma City for Superior Oil Co., has resigned to join Panhandle Eastern Pipe Line Co. as manager of exploration and production. **Leo P. Stonis** will succeed Repecka with Superior.

John Kelly, formerly vice president of Continental Pipe Line Co., has been promoted to assistant general manager of Continental Oil Co.'s southwest region. He will headquarter in Fort Worth. Kelly succeeds **Roy M. Mays,** who recently was transferred to Houston as director of reserves and production acquisitions.

Glenn Sutphin, engineer with Hood Construction Co. in Glasgow, Mont., has been transferred to Hood Northwest Pipeline Co. in Boise, Idaho, as engineer.

Paul Weaver, Houston consultant, has been named Engineer of the Year by the San Jacinto chapter of the Texas Society of Professional Engineers. Weaver retired from Gulf Oil Corp. in 1952. He has been a professor of geology and geophysics at Texas A&M College and a consultant since that time. He is a past president of American Association of Petroleum Geologists.

Alex C. Boardman, formerly senior geologist with British-American Oil Producing Co., has joined Baumgartner Oil Co., Denver.

Alan Beerbower and **Dr. Max W. Hill** have been appointed research associates by Esso Research & Engineering Co. **Frederick J. Hart** has been named section head in the products research division, and **Randolph M. Bailly** has been named section head, process research division.

Harold R. Horner, Jr., assistant to the general manager of research and development for Jefferson Chemical Co., has been appointed manager of the Conroe, Tex., plant. Jefferson acquired the Conroe plant from Gulf Oil Corp. February 1. It will be used for development and production of new products.

C. G. Cooper, senior geologist for Shell Oil Co. in Midland, Tex., has retired after 33 years with the Royal-Shell companies. Cooper joined Shell in England in 1926. After assignments in Venezuela, The Hague, and Egypt, he moved to Midland in 1938. He had been senior geologist, special studies, there since 1953.

Dr. John W. Ryznar, vice president and technical director of Nalco Chemical Co., has been promoted to technical representative in corporate management, a new position. He will be responsible for planning, guiding, and coordinating all technical activities of the company and its subsidiaries. **Dr. William P. Hettinger, Jr.,** has been appointed director of research for Nalco. He has been head of research for the catalyst division and will continue to coordinate research in this division.

Deaths

Kenneth A. Spencer, 58, chairman and founder of Spencer Chemical Co., died February 19 in a Miami Beach hospital. He had suffered a heart attack earlier this month. Spencer was also president of Pittsburg & Midway Coal Mining Co.

James B. McDaniel, 55, lease-records department manager for Sunray Mid-Continent Oil Co., died February 17 in a Tulsa hospital. He had been with Sunray Mid-Continent and its predecessors since 1928.

Edwin Fred Thomas Stevens, 51, manager of Royalite Oil Co.'s refining division in Calgary, died February 17

▶▶▶ Personals

L. C. Case, formerly senior corrosion engineer with Gulf Oil Corp., has taken early retirement and opened consulting offices in Tulsa. Since 1925 Case has devoted his efforts to water problems encountered in oil production. He will specialize in field and laboratory work with water flooding, salt-water disposal systems, and other water problems.

Clyde J. Gurley, formerly with British-American Oil Producing Co., has been named production engineer for Northern Natural Gas Producing Co. in Omaha.

Robert E. Wilson, former chairman of Standard Oil Co. (Ind.), has been named a member of the Atomic Energy Commission by President Eisenhower. He will fill a 4-month vacancy created by death of a member of the five-man board and then will begin a 5-year term of his own.

Nixon L. Ballard, formerly president and general manager of Mobil Oil Lebanon, Inc., has been named president and general manager of Mobil Oil Egypt, Inc., and Socony-Vacuum Oil Co. of Syria, Socony Mobil Oil Co. subsidiaries in the United Arab Republic. Ballard succeeds **J. B. Eckert,** who has been named Middle East regional executive, marketing and manufacturing, for Mobil International Oil Co. **E. G. Hymas,** formerly with Mobil International in New York, will succeed Ballard with Mobil Oil Lebanon in Beirut.

John E. Brewer, district geologist for Lario Oil & Gas Co., Wichita, has resigned to join Thunderbird Drilling, Inc.

John R. Puryear, geologist in Sinton, Tex., for Plymouth Oil Co., has been appointed regional geologist in Sinton. He succeeds **A. Lee Jones,** who has retired.

J. C. Martin, Jr., formerly Slidell, La., consultant, has been elected vice president and a director of United Cuban Oil, Inc. He will headquarter in Houston.

American Petroleum Institute and **Willard M. Wilson,** API secretary, have received Freedom Foundation awards for activities during oil's centennial celebration last year. API will receive the George Washington honor medal for materials prepared and distributed during the centennial. Wilson's award is given in recognition of his speech to the Holdrege, Neb., high school graduating class last year.

W. O. Crabtree has been named special instruments group head in the petroleum technical service department at the Baton Rouge, La., refinery of Humble Oil & Refining Co.'s Esso Standard division. He succeeds **R. B. Greene,** who recently joined Standard Vacuum Oil Co. **J. W. White,** equipment engineering group head, has replaced Crabtree as project-engineering group head, mechanical-engineering department. **B. B. Graves,** equipment and methods analysis group head, mechanical-technical service, has succeeded White. **B. E. Crawford,** special-problems group head, has replaced Graves. **H. B. Rawl,** engineer, has succeeded Crawford.

Don Ziegler, geologist with The California Co., has been transferred to Grand Junction, Colo., from Billings, Mont.

J. A. Petty, petroleum engineer with Mobil Oil Co. in Duncan, Okla., has been promoted to production foreman and transferred to Healdton, Okla.

Ray C. Smith has been elected vice president and a director of Sinclair Petrochemicals, Inc. He will continue as manager of domestic sales. Smith joined Sinclair Research Laboratories, Inc., in 1947 as a technologist. He was named manager of market development for Sinclair Petrochemicals in 1952 and manager of domestic sales in 1956.

Eugene C. Herthel, assistant to the vice president of Sinclair Refining Co., has retired after 43 years with the company.

Jack Arnold, Jr., manager of the Boston office of Enjay Co., Inc., has been named marketing coordinator of the company's butyl division. He will headquarter in New York.

John T. Pinkston has been elected a vice president of United Engineers & Constructors, Inc., Philadelphia. He will continue as process consultant, in charge of all process development activity. He also will be in charge of gas industry activity for the company.

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in Calgary after a long illness. Stevens was field manager of Royalite's Turner Valley operations before moving to Calgary in 1952.

H. T. (Tom) Cowan, 64, retired warehouse superintendent for Williams Brothers, died February 20 in Tulsa after a heart attack.

Frank Fletcher, 63, partner in Fletcher Oil Co., Los Angeles, died February 16 in a Santa Monica, Calif., hospital.

James Willis Rockwell, 51, sales manager of Axelson Manufacturing Co.'s hydraulic division, died February 19 in Bakersfield, Calif., after a heart attack. He had been with Axelson since 1938.

J. P. (Jack) Moore, 59, Evansville, Ind., independent operator, died February 18 in an Evansville hospital.

Aaron M. Weitzenhoffer, 65, president of Davon Oil Drilling Co., died February 23 in an Oklahoma City hospital.

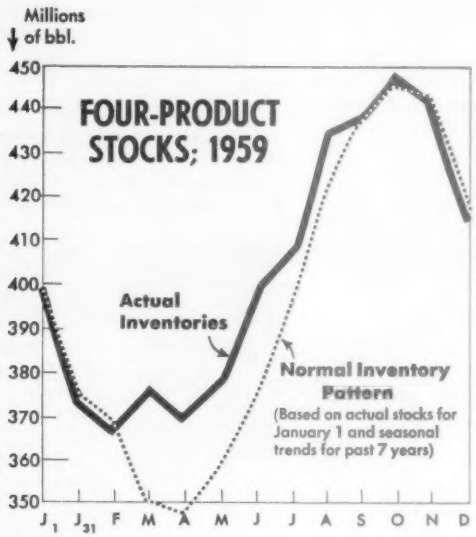
Captain George E. Bridgett, 97, retired tanker captain for Esso Standard division of Humble Oil & Refining Co., died recently at his home in San Francisco. Bridgett was the oldest pensioned employe of any Standard Oil Co. (N.J.) affiliate. He retired in 1927.

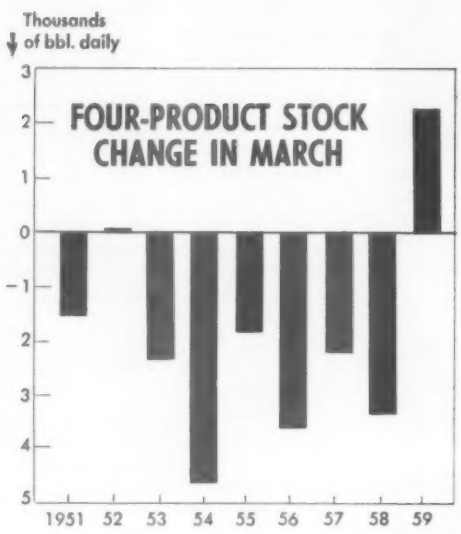
Edward L. Clay, 72, retired district manager in Hollywood, Calif., for Shell Oil Co., died February 19 in a Glendale, Calif., hospital after a long illness.

John Flugstad, 41, engineer with the Montana Oil and Gas Conservation Commission, died February 14.

Sydney J. Chester, 54, secretary and general counsel of Western Geophysical Co. since 1944, died February 19 at his home in Los Angeles.

Max D. Munder, 64, Tulsa division manager of National Supply Co.'s tubular department, died February 22 at his home in Tulsa after a heart attack.





Look again at stock comparisons

BY JOHN C. CASPER

DON'T BE FOOLED by stock comparisons over the next 6 weeks. The four-product stock increase over last year will go down, but that decrease may not indicate improvement in the current stock position unless these changes are very large.

The oil industry is sick, inventory sick. It has a bad case of stomach ache from taking on more refined products than it could digest. It did the same thing last year with this one difference. It ate most of the green apples near the end of the heating season rather than during December and January.

Stocks of the four major products totaled 398,995,000 bbl. on February 12 this year for an increase of 35,021,000 bbl. or 9.6% over last year. If that big increase over last year is cut to 30,000,000 bbl. by the end of the month, it will not prove that the industry is recovering from its stomach ache. Most of the pseudo-improvement will be due to the fact that industry was having more trouble last year than now.

Four-product stocks decreased only 3,900,000 bbl. in February last year, and weekly reports show that stocks actually increased in the last half of the month. This means that a moderate reduction in stocks for the last half of February may look good in comparison with the increase last year.

The same conditions of low demand and high refinery production extended into March last year.

It is normal for March demand to be about 800,000 bbl. daily under the average for December and January. But, March demand last year was almost 1,300,000 bbl. daily below the December-January average.

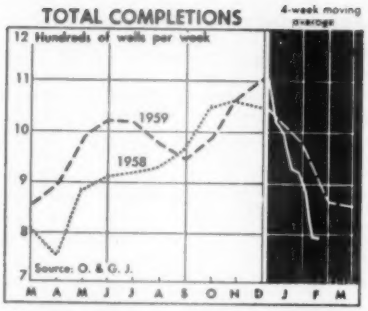
On the supply side, refinery runs for March in recent years have been down about 100,000 bbl. daily from the December-January average. But runs for March 1959 showed a gain of 98,000 bbl. daily over December and January.

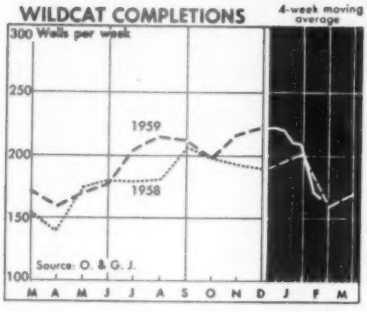
This combination of above-normal refinery runs and below-normal demand was balanced out by a gain in product stocks. Four-product inventories increased 6,800,000 bbl. during March 1959. The average March four-product stock change in the postwar period has been a reduction of about 7,000,000 bbl.

Even if product stocks do not change from the middle of February to the end of March this year, the 35,000,000-bbl. overage would be trimmed to about 24,000,000 bbl. by the end of March. Refiners need to do much better than that.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,329,360	UP	50,690	UP	122,250
Crude stocks	248,916,000	DOWN	435,000	DOWN	7,116,000
Completions	830	UP	91	DOWN	40
Refinery runs	8,081,000	UP	4,000	UP	29,000
Gasoline stocks	212,942,000	UP	4,034,000	UP	7,955,000
Kerosine stocks	22,987,000	DOWN	722,000	UP	3,339,000
Distillate stocks	112,597,000	DOWN	5,743,000	UP	28,576,000
Residual stocks	46,421,000	DOWN	1,617,000	DOWN	9,109,000
Four-product stocks	394,947,000	DOWN	4,048,000	UP	30,761,000
Total imports	2,092,000	UP	477,100	UP	160,200





Active Rotary Rigs

	2-22-60	2-15-60	2-23-59
Alabama	3	3	9
Arkansas	14	13	5
Arizona	1	0	0
California	74	69	80
Land	69	64	77
Offshore	5	5	3
Colorado	26	26	30
Florida	1	1	1
Land	0	0	1
Offshore	1	1	0
Illinois	19	15	7
Indiana	4	4	0
Iowa	1	1	3
Kansas	96	80	129
Kentucky	5	7	2
Louisiana	290	295	327
North	27	30	35
S. Inland waters	111	120	145
S. Land	94	96	107
Offshore	58	49	40
Maryland	0	0	1
Michigan	34	32	18
Mississippi	79	80	54
Missouri	1	2	0
Montana	12	11	17
Nebraska	24	17	23
Nevada	0	0	0
New Mexico	90	83	106
New York	0	0	0
North Dakota	13	17	30
Ohio	3	3	1
Oklahoma	187	175	220
Oregon	0	0	0
Pennsylvania	9	10	12
South Dakota	0	0	1
Texas	615	589	696
S. Inland waters	3	6	8
S. Land	171	158	128
Offshore	0	0	0
North	44	42	142
East	53	51	(*)
Panhandle	56	50	(*)
West Central	192	198	269
West	96	84	149
Utah	29	27	37
Washington	0	1	1
West Virginia	3	3	3
Wyoming	50	54	48
Total U. S.	**1,683**	1,618	1,861
Western Canada	255	242	229
Eastern Canada	4	4	0
Grand total	1,942	1,864	2,090

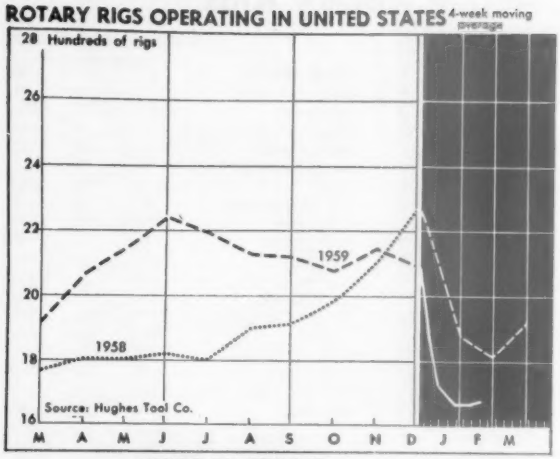
Hughes Tool Co. report. *Included in north. Comparisons not available due to change in method of reporting.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 20, 1960

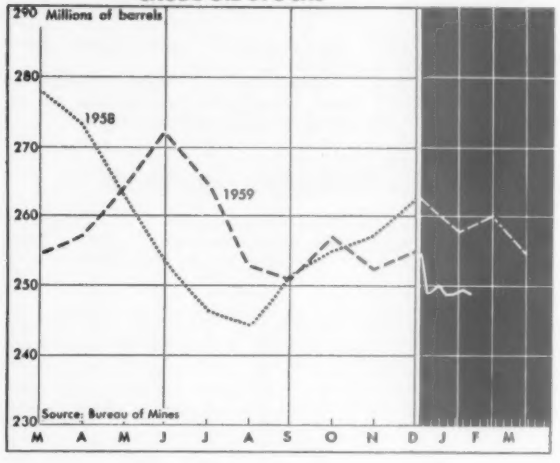
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	0	0	0	0	0	0	0	8	20	0	0	0	0	0	1	3
Arizona	0	0	0	0	0	0	0	6	.....	0	0	0	0	0	6	.....
Arkansas	20	14	0	0	6	0	64,781	92	152	5	1	0	0	4	24	27
California	15	7	0	2	4	2	96,361	190	254	6	1	0	1	4	43	62
Colorado	18	4	0	2	12	0	86,421	110	107	8	1	0	1	6	55	52
Illinois	95	27	0	0	44	24	172,586	403	356	24	3	0	0	21	97	57
Indiana	26	6	0	1	19	0	31,770	147	97	12	1	0	0	11	53	30
Kansas	71	40	0	1	29	1	242,076	517	613	17	1	0	0	16	161	143
Kentucky	30	5	0	9	16	0	62,167	325	234	5	1	0	0	4	40	24
Louisiana	47	21	3	3	19	1	389,703	489	542	6	0	0	0	6	64	81
North	13	4	0	3	6	0	42,519	165	200	2	0	0	0	2	29	44
South	22	14	3	0	4	1	219,549	242	287	2	0	0	0	2	30	36
Offshore	12	3	0	0	9	0	127,635	82	55	2	0	0	0	2	5	1
Michigan	16	10	0	0	6	0	58,200	105	82	6	2	0	0	4	40	24
Mississippi	12	7	2	0	3	0	119,510	104	100	4	1	0	0	3	39	50
Montana	0	0	0	0	0	0	0	40	42	0	0	0	0	0	22	14
Nebraska	12	4	0	0	8	0	68,093	106	101	5	2	0	0	3	41	45
New Mexico	32	17	0	5	10	0	152,837	296	262	6	1	0	0	5	41	25
West	9	4	0	3	2	0	35,521	101	.....	2	1	0	0	1	9	.....
East	23	13	0	2	8	0	117,316	195	.....	4	0	0	0	4	32	.....
New York	0	0	0	0	0	0	0	50	52	0	0	0	0	0	5	1
North Dakota	2	2	0	0	0	0	15,278	40	70	0	0	0	0	0	7	20
Ohio	20	11	0	4	5	0	40,744	186	121	1	0	0	0	1	10	4
Oklahoma	73	36	1	11	25	0	337,343	568	849	11	3	0	1	7	111	142
Pennsylvania	67	17	0	29	8	13	208,611	67	59	3	0	0	1	2	5	1
South Dakota	0	0	0	0	0	0	0	4	.....	0	0	0	0	0	2	.....
Texas	218	104	13	10	88	3	1,010,342	2,341	2,819	39	4	1	1	33	499	555
District 1	8	3	0	1	4	0	36,782	172	208	2	0	0	0	2	66	53
District 2	8	2	2	1	3	0	60,353	98	118	2	0	0	0	2	26	38
District 3	20	7	3	0	10	0	143,946	200	172	4	0	1	0	3	39	52
District 4	14	3	1	2	8	0	62,337	200	205	5	1	0	1	3	60	60
East	19	7	3	0	9	0	109,239	196	171	2	0	0	0	2	40	41
District 7-B	43	19	0	1	23	0	151,623	316	343	12	1	0	0	11	92	108
West	35	24	2	0	9	0	218,254	619	890	6	1	0	0	5	104	98
District 9	41	20	1	0	17	3	96,361	400	508	5	1	0	0	4	64	85
District 10	30	19	1	5	5	0	131,447	140	204	1	0	0	0	1	8	20
Utah	7	3	0	1	3	0	32,173	42	56	3	0	0	1	2	16	16
West Virginia	34	1	0	28	5	0	75,654	126	106	0	0	0	0	0	1	4
Wyoming	15	9	0	0	6	0	58,264	134	126	5	2	0	0	3	55	51
Miscellaneous	0	0	0	0	0	0	0	4	11	0	0	0	0	0	3	8
Total U. S.	**830**	345	19	106	316	44	3,322,914	6,500	7,231	**166**	24	1	6	135	1,441	1,439
Prev. week	739	341	12	73	285	28	3,073,211	.....	.....	167	19	0	5	143	.....	.....
Cum. 1960	6,500	3,015	210	588	2,481	206	27,981,134	.....	.....	1,441	140	14	45	1,242	.....	.....
Cum. 1959	7,231	3,627	191	482	2,742	189	30,772,213	.....	.....	1,439	148	20	49	1,222	.....	.....
Western Canada	59	36	0	6	18	0	341,914	311	311	14	2	0	1	11	85	110

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	2-13-60	2-6-60	1-14-59
Pennsylvania	2,330	2,317	2,528
Other Appalachian	1,873	2,062	1,668
Illinois, Indiana, Michigan	9,792	9,540	9,452
Nebraska and North Dakota	2,560	2,602	2,394
Kansas	9,335	‡9,290	9,177
Oklahoma	16,950	16,798	15,775
Arkansas	2,187	2,222	2,051
Louisiana	18,867	18,915	18,011
North	2,972	2,853	2,920
South	15,895	16,062	15,091
Mississippi, Alabama, Florida	2,251	2,296	2,336
New Mexico	7,359	7,446	8,635
Texas	105,834	105,489	115,072
East Texas	8,114	7,869	8,430
West Texas	49,254	48,637	57,166
Texas Gulf	19,105	19,150	19,448
Other Texas	29,361	29,833	30,028
Wyoming	17,355	17,396	13,361
Other Rocky Mountain	9,255	9,395	8,864
California	28,595	28,643	34,403
Foreign	†14,373	14,940	12,305
Total	**248,916**	‡249,351	256,032

*Bureau of Mines. †Includes 4,211,000 bbl. in California. ‡Revised.

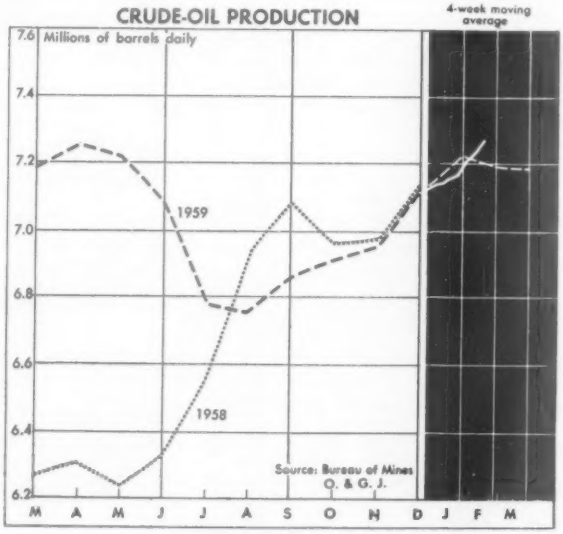
DAILY AVERAGE PRODUCTION FOR WEEK

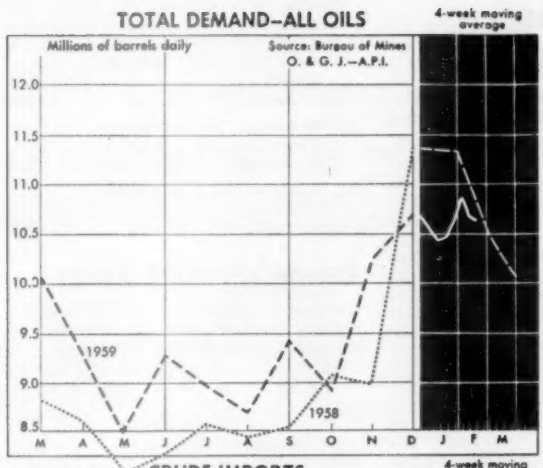
	February 20, 1960			Feb. 13
	Crude oil	Lease condensate	Total	total
Alabama	19,202	.....	19,200	19,175
Arkansas	84,175	300	84,475	79,025
California	827,700	.....	827,700	832,000
Colorado	129,300	.....	129,300	128,800
Eastern	40,300	.....	40,300	42,900
Florida	1,150	.....	1,150	1,150
Illinois	211,500	.....	211,500	208,100
Indiana	33,200	.....	33,200	33,000
Kansas	†324,360	.....	†324,360	†298,870
Kentucky	66,000	.....	66,000	67,600
Louisiana	957,175	132,600	1,098,775	1,088,500
North	109,175	6,100	115,275	114,000
South	848,000	126,500	974,500	974,500
Michigan	28,500	.....	28,500	28,300
Mississippi	140,200	5,025	145,225	145,225
Montana	78,000	.....	78,000	79,300
Nebraska	63,500	.....	63,500	62,900
Nevada	100	.....	100	100
New Mexico	297,900	6,700	304,600	304,600
North Dakota	59,900	.....	59,900	56,800
Oklahoma	†563,150	.....	†563,150	†543,500
Texas	2,706,000	90,225	2,796,225	2,796,225
Dist. 1	41,000	3,800	44,800	44,800
Dist. 2	119,000	9,200	128,200	128,200
Dist. 3	355,000	38,500	393,500	393,500
Dist. 4	190,000	15,800	205,800	205,800
Dist. 5	27,000	500	27,500	27,500
Dist. 6	119,000	9,400	128,400	128,400
East Texas Field	147,000	.....	147,000	147,000
Dist. 7-B	139,000	200	139,200	139,200
Dist. 7-C	130,000	3,625	133,625	133,625
Dist. 8	1,139,000	5,600	1,144,600	1,144,600
Dist. 9	192,000	2,200	194,200	194,200
Dist. 10	108,000	1,400	109,400	109,400
Utah	110,500	.....	110,500	109,400
Wyoming	351,400	.....	351,400	352,000
Others	‡1,300	.....	‡1,300	‡1,200
Total U. S.	7,094,510	234,850	**7,329,360**	7,278,670
Change from prev. week, up			**50,690**	
Canada	†590,000	.....	†590,000	†542,500

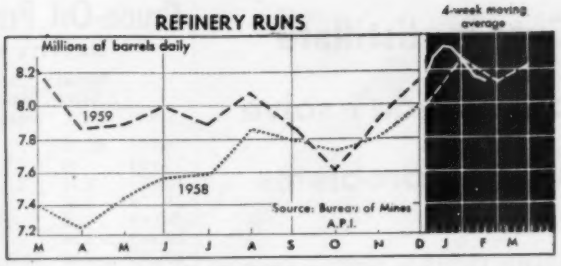
Total U. S. prod., January 1-February 20 ..... 368,468,420 bbl.
Same period last year (crude plus cond.) ..... *367,738,700 bbl.

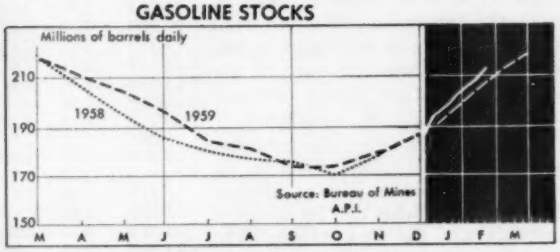
*Includes 10,022,500 bbl. condensate. †Week ended previous Monday. ‡Alaska and South Dakota.

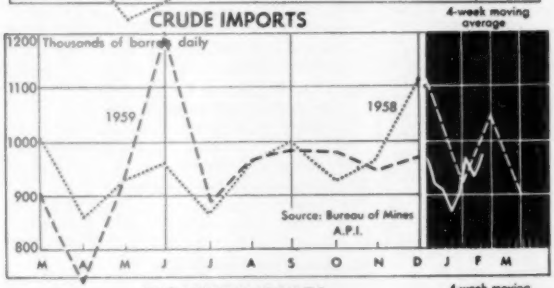
CRUDE-OIL PRODUCTION

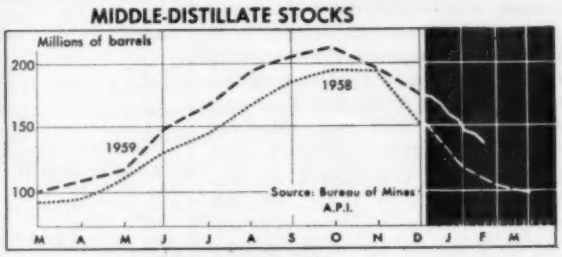


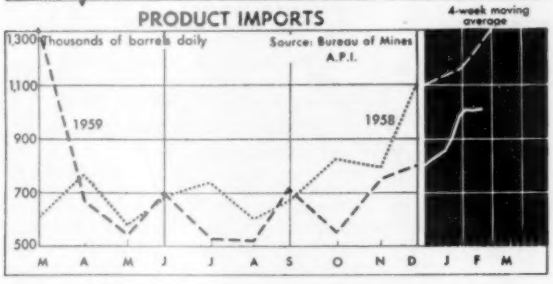

TOTAL DEMAND–ALL OILS
Millions of barrels daily
Source: Bureau of Mines
O. & G. J.—A.P.I.
4-week moving average
1959
1958
M A M J J A S O N D J F M

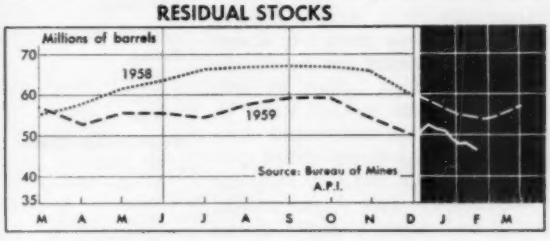












API REFINERY REPORT—FEBRUARY 19, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, February 1959 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,121	553.8	25.3	349.7	180.3	42,729	9,804	42,130	12,681	1,223	562.0	50.8	437.5	217.9
Appalachian:														
District 1	101	39.6	4.6	19.6	16.4	6,008	623	2,921	318	101	41.2	6.6	24.1	13.0
District 2	106	56.9	6.6	18.6	14.3	3,058	419	1,291	365	115	55.9	9.9	21.9	17.1
Ind., Ill., Ky.	1,496	783.8	62.0	295.7	206.0	40,024	4,415	18,936	4,827	1,505	714.3	81.3	381.6	234.0
Minn., Wis., Dak.	123	56.7	9.4	29.9	16.7	7,254	805	5,076	599	104	52.1	5.8	26.1	12.9
Okla., Kans., Mo.	753	414.6	15.9	185.2	23.3	21,500	988	9,053	1,001	778	419.4	16.9	225.5	38.8
Inland Texas	293	198.6	12.2	41.7	20.4	8,289	445	1,468	2,416	290	196.2	8.9	51.0	22.3
Tex. Gulf Coast	1,885	922.9	96.4	446.0	136.0	27,716	2,312	11,261	4,906	1,775	807.9	139.4	517.1	183.3
La. Gulf Coast	675	324.3	50.3	140.0	48.3	12,142	1,823	4,102	1,064	716	351.5	78.4	189.3	52.5
N. La. and Ark.	108	40.6	7.4	18.7	8.3	5,225	650	2,398	192	106	51.1	6.9	24.0	6.4
Rocky Mtn.:														
New Mexico	27	15.1	0.6	4.7	4.1	929	65	168	138	25	12.4	0.7	4.4	2.5
Other	309	145.7	4.1	70.9	31.2	7,438	210	2,321	1,074	293	136.9	4.6	61.5	38.4
West Coast	1,084	521.4	5.1	184.0	264.0	30,630	428	11,472	16,840	1,096	538.1	7.2	195.1	285.7
Feb. 19, 1960	8,081	4,074.0	299.9	1,802.7	969.3	212,942	22,987	112,597	46,421	8,127	3,939.0	417.4	2,159.1	1,124.8
Feb. 12, 1960	8,077	4,038.0	354.7	1,766.1	1,025.4	208,908	23,709	118,340	48,038	.....	.....	.....	.....	.....
Feb. 20, 1959	8,052	3,994.7	397.7	2,226.3	1,023.1	204,987	19,648	84,021	55,530	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Cuts in distillate prices didn't solve storage problems

REDUCTIONS in distillate prices on the Gulf Coast did not solve the area's problem. Even with the colder weather in the northeastern part of the country, Gulf-East Coast distillate stocks continue to be burdensome.

Within a week after the reduction in kerosine and distillate prices on the Gulf Coast, markets rumors indicate that these light fuels can be found at discounts off the new prices. The amount of the discount will depend on how desperate the refiner is in his need to move some distillate. With a little shopping around, a potential buyer probably could find some spot No. 2 at least 0.25 cent under the current formal posting of 8.00 cents.

The general Gulf-East Coast distillate market is in a very unstable position. If the series of winter storms that have moved across the country continue into early March, distillate demand will be up enough to absorb part of the distressed heating oil. On the other hand, a return of mild weather could add to Gulf Coast inventories at a rate that would cause some refiner to drop his formal quotation for No. 2. Refinery runs and the weather will furnish the answer.

No. 2 fuel on the Group 3 market is fairly firm at 8.5 cents a gallon. There has been no general oversupply of No. 1 fuel, and this trend accounts for the strong market for No. 1. Most refiners are pricing No. 1 a cent a gallon above No. 2. Last summer the difference was 0.75 cent.

Most of the spot regular gasoline on the Group 3 market is moving at 10.50 cents a gallon, but there are unconfirmed reports of a few sales at 10.25 cents. Gasoline prices are subnormal even after the latest increase. Quotations this year have been the lowest since 1955 when 86-octane regular was quoted at 10.25 cents in the early months of the year.

Gulf Coast refiners are long on high-octane gasoline. All reports of softening gasoline markets in the area show larger discounts for premium grades than for regular. This trend could result in lower postings for premium grades both on the Gulf Coast and in the Group 3 area.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa	Gulf Coast Tex.*	West Tex.† N.M.	Wyo. (sour)
14-14.9	$1.76	....	....	....	....
15-15.9	1.84	....	....	....	$1.81
16-16.9	1.92	....	....	....	1.86
17-17.9	2.00	....	....	....	1.91
18-18.9	2.08	....	....	....	1.96
19-19.9	2.16	....	....	....	2.01
20-20.9	2.24	$2.49	....	$2.35	2.06
21-21.9	2.32	2.52	....	2.38	2.11
22-22.9	2.39	2.55	....	2.41	2.16
23-23.9	2.46	2.58	$3.44	2.44	2.21
24-24.9	2.53	2.61	3.46	2.47	2.26
25-25.9	2.60	2.64	3.48	2.50	2.31
26-26.9	2.67	2.67	3.50	2.53	2.36
27-27.9	2.74	2.70	3.52	2.56	2.49
28-28.9	2.81	2.73	3.54	2.59	2.54
29-29.9	2.87	2.76	3.56	2.62	2.59
30-30.9	2.93	2.79	....	2.65	2.63
31-31.9	3.00	2.82	....	2.68	2.67
32-32.9	3.06	2.85	....	2.71	2.71
33-33.9	3.12	2.88	....	2.74	2.75
34-34.9	3.17	2.91	....	2.77	2.79
35-35.9	3.22	2.94	....	2.80	2.83
36-36.9	3.27	2.97	....	2.83	2.87
37-37.9	3.31	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Low cold test crude. †Sour.

Effective dates of broad changes: California, 9-11-59; East of California, January 3-10, 1957; Pennsylvania Grade 1-11-60.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.55
Middle District	4.37
Southwest Pennsylvania	4.10
West Virginia	3.92
Buckeye Grade	3.77
Illinois Basin	**3.80**

FOREIGN

Canada:	
Leduc-Woodben	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38
Venezuela:	
Cumarebo, 48°-9°, Tucupido	3.34
San Joaquin, 41°-41.9°, Puerto La Cruz	3.08-3.10
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):	
Arabian, about 34°, Ras Tanura	$1.90
Iranian, 34.0°-34.9°, Bandar Masur	1.80
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05
Middle East, E. Mediterranean:	
Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.57

Refined-Product Prices

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★Regular (91 octane)	10.50-10.75
★Premium (99 octane)	13.00-13.50
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.25-10.50
Regular (92 octane)	10.50-10.75
Premium (98 octane)	11.75-12.00
California (rack) Los Angeles):	
Regular (88 octane)	11.65-12.15
Premium (94 octane)	12.65-13.15
Premium (100 octane)	14.00-14.65
Caribbean area (cargoes):	
Regular (87 octane)	10.125
Premium (97 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
★Kerosine 42-44	9.50- 9.75
★Diesel oil (58 d.i. and above)	9.25- 9.50
★Distillate No. 1	9.25- 9.50
★Distillate No. 2	8.50- 8.75
Gulf Coast (cargoes):	
★Kerosine 41-43	9.00
★Distillate No. 2	8.00
New York Harbor (barges):	
★Kerosine 41-43	10.30
★Distillate No. 2	9.30
★Diesel fuel, 48-52 d.i.	9.60
Caribbean area (cargoes):	
★Distillate No. 2	8.00

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.70-1.80
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

Gulf-NY, dirty (ATRS—30%)	$2.00
Carib-NY, dirty (ATRS—55%)	1.24
Carib.-UK, clean (Scale—35%) (21s. 2d.)	2.96
Carib.-UK, dirty (ATRS—55%)	2.93

★Denotes change from previous week.

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Perhaps *your* organization, too, has been taking your Payroll Savings Plan for granted. It's a great idea, but its value to your people and to your company increases with the number of employees who use it, *every payday*. Let your State Savings Bonds Director show you how easy it is to get your company back in the high value area of participation. Or write Savings Bonds Division, U.S. Treasury Department, Washington, D.C.

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Tulsa 1, Oklahoma

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USED 170 H.P. D337 Caterpillar Diesel with 6,000 hours. Will sell reasonable. Contact Wayne E. Booker, R. R. #2, Calhan, Colorado.

1 HYDRAULIC CASING pulling machine, complete. Price $6,500. Sell or trade. Woodford Supply Company, P. O. Box 84, Phone CE-51454, Oklahoma City 1.

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COMPRESSORS, Clark Gas RA-5; Clark Cent. 7,860 CFM 2 Stage
CONDENSERS 7,500 to 100 sq. ft.
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ONE THREE-STAGE Wilson complete packaged gas compressor. Alfred B. Kern, 305 Kennedy Bldg., Tulsa, Oklahoma.

18" AND 20" good used pipe. Very attractive prices. Contact: The Tri-State Pipe Co., Bellaire, Ohio. Telephone OR 6-1452.

1—ALDRICH 3½" x 7" Triplex salt water pump, with Lufkin gear reducer and 100 HP electric motor. Capacity 6,000 bbl. per day, 820 lbs. pressure. Price $3,500.00. Woodford Supply Company, P. O. Box 84, Phone CE 5-1454, Oklahoma City 1.

1075CFM, Ingersoll Rand, 6-XVO 13/13/9-1/4 x 12, with Intercooler Aftercooler, very good condition, 1943 machines, (3) available at a bargain price on East Coast.

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15,000 ft., 5½" OD-15.5#, J55, Long Coupling
5,000 ft., 7" OD-20#, J55
10,000 ft., 2⅜" OD-4.7#, J55, EUE Tubing
Sucker rods, line pipe, tanks and pumping units.
All No. 1 Grade—Used
29,000 ft., 4½" OD-15.5#, SS, 30 ft. PE Tubing—New
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2,000,000 ft.	2"	3.50# to the ft.
1,000,000 ft.	3"	7.70#
1,000,000 ft.	4"	10.98#
500,000 ft.	6"	19.80#
200,000 ft.	8 5/6"	28#
400,000 ft.	10¾"	35#
75,000 ft.	12¾"	40#
10,000 ft.	16"	42#

All No. I Grade plain end and cleaned.

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NATIONAL "50" Rotary rig. Complete with 96' Lee C. Moore mast, 2 Waukesha "NK" motors, 7¼ x 14 Wheland pump, 6,000' of 4½" drill pipe. Cash, or will trade for production or producing equipment. L. B. Jackson Company, Box 717, Sapulpa, Oklahoma.

FOR SALE—1 National T-32 Drilling Rig, complete, excellent condition Twin Disc Torque Converter, powered by Twin 6-71 GM Diesels, 127 ft. Lee C. Moore Mast, Substructure, C-250 Ideal Mud Pump, powered by Twin 6-71 GM Diesels, 5,100 ft. good 4½" drill pipe, 5 collars 5¾". Located in Kansas. Bachus Oil Company, 721 East Central, Wichita 2, Kansas. Phone AMherst 5-9531.

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1 —**USED** 127' Lee C. Moore Bolted Type Mast Mounted on 7' high Substructure. Located Oklahoma City. Price $11,000.00

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1—36-L BUCYRUS ERIE spudder, trailer mounted, less tools. Price $7,000.00. Woodford Supply Company, P. O. Box 84, Phone CE 5-1454, Oklahoma City 1.

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BUDA POWER UNITS: Unused surplus, new condition. Four cylinder, 121 HP gasoline engines. Complete with radiator. Twin disc clutch and 5 sheave V-belt drive pulley. Can be operated on LP or natural gas. Priced at fraction of cost, $1,495.00 each. Photograph and complete specifications on request. Oldfield Equipment Co., 430 West Seymour Ave., Cincinnati 16, Ohio.

5,000 FT. of 16" O.D. 31# Weight Spiralweld Steel Pipe in 40 Ft. R/L. Suitable for surface casing, pressure lines, drainage or road crossing pipe. Good used condition. Price, $3.00 foot F.O.B. our yard. Write or phone: M. Kaplan & Sons Inc., Monroe, Louisiana, FAirfax 2-5112.

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EQUIPMENT WANTED

WANTED: Gardner Denver 5 x 10 pump, with high pressure fluid end. Also Triplex Plunger pumps. Write P. O. Box 65, Clarkwood, Texas.

WANTED used seismic instrument, type SIE G 33, in good condition. Box L-699, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

CHEMIST OR CHEMICAL ENGINEER

With broad knowledge of refining industry. For technical writing and editing on refining, motor fuel, lubricants, petrochemical and related fields. Prior writing or editing experience desirable. Creative, important job. **Send resume to:**

Employment Manager
ETHYL CORPORATION
1600 West Eight Mile Road
Ferndale 20, Michigan

HELP WANTED

TENNESSEE GAS AND OIL COMPANY
a division of
TENNESSEE GAS TRANSMISSION COMPANY
has a career opportunity for a
GEOPHYSICIST
for its Corpus Christi Office

Must have a degree in geology, geological engineering or geophysics and a minimum of five years responsible interpretive experience in the Gulf Coast Area. Age to 36. Send complete description of education and experience to:

Employment Office, Tennessee Gas Transmission Co.

P. O. Box 2511, Houston 1, Texas

(All replies will be held in confidence.)

LARGE INDEPENDENT seeking petroleum engineer with three to five years experience. Previous training in reservoir and secondary recovery analysis. Location: Great Bend, Kansas. Write in c/o Box 309, Great Bend, Kansas.

SALES AGENTS—Eastern manufacturer supervisory control systems, data logging, telemetering systems, special computers, all-electronic valve operators and electronic process controllers, desires sales agents west of Mississippi. Equipment market: process plants, pipelines, power, grids, water and sewerage grids and refineries. Write: Box L-741, The Oil and Gas Journal, Tulsa, Oklahoma.

ECONOMICS ANALYST

Major Oil Company has vacancy in each of two producing division offices. Requires college degree in economics, knowledge of producing operations, and experience in mathematical analysis of economic problems. Expected starting salary $11,000 to $13,000. Send two copies of complete resume to: Box L-726, The Oil and Gas Journal, Tulsa, Oklahoma.

ELECTRONIC INSTRUMENT REPAIRMAN

15,000 BPD Refinery with future expansion indicated needs services of experienced Instrumentman. Both electronic and pneumatic in use. Send resume and recent picture to, Personnel Director, Lake Superior Refining Co., Superior, Wisconsin.

NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, butane and pipeline companies. Nationwide, $6.00 cash. OIML Co., Box 2603, Tulsa, Oklahoma.

MAJOR GAS Transmission Company needs Engineer, with 3-5 years experience to supervise drilling, completion, and workover of wells. In reply, send resume of experience, personal data, and college transcript to Box L-713, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY MAINTENANCE Engineer with at least two to three years experience, willing to develop into maintenance supervisor for modern refinery in mid-continent area. Our employees have been informed of this advertisement. Box L-731, The Oil and Gas Journal, Tulsa, Oklahoma.

AGENTS WANTED throughout U.S.A. and foreign to market the Macro downhole casing testing tool. Proven in over 1,000 field tests. Excellent profit margin for very small investment. Write: Macro Limited, 534—6th Avenue S.W., Calgary, Alberta, Canada or phone Calgary AMherst 3-2839.

JOBS—JOBS—JOBS, FOREIGN—DOMESTIC employment. 1959 Applicants should reapply for a brand new type of service. No obligation, write for free information. Accredited Personnel Services, Inc., P. O. Box 6006, New Orleans 14, La.

Refineries Chief Inspector

Fast growing, independent, integrated oil company, in the South West requires man of integrity and sound technical ability, to act as an inspector of refinery processing equipment. Minimum qualifications of high school education, 5 years, refinery maintenance experience and two years actual inspection work. Maximum age 40. Write, sending complete resume of education, experience, marital status and salary required, to:

Box L-739, The Oil and Gas Journal
Tulsa, Oklahoma

PETROLEUM ENGINEERS MIDDLE EAST

Aggressive independent oil company operating in middle east, has openings for production division head with separating, field processing and movement experience; and for experienced reservoir engineer. Top salaries. No taxes. Family accommodations plus subsistence allowance. Two year contracts. Two months vacation plus travel plus transportation. Paid short vacation and local travel end first year. Free medical, recreation and company participation childrens schooling. Send detailed resume to:

BOX L-725
THE OIL AND GAS JOURNAL
TULSA, OKLAHOMA

NATURAL GASOLINE PLANT ENGINEERS

Oil Company has immediate need for two qualified men with chemical and/or mechanical engineering degree. Require at least five years experience in all phases of natural gasoline plant operation and treatment of sour gas. Duties involve general plant engineering including laboratory control testing, plant performance tests and plant maintenance. Experience as supertindent of natural gasoline plant operations also highly desirable.

Inquiries held confidential.

Please send resume of background and experience to:

P. O. BOX 17113, FOY STATION

LOS ANGELES, CALIFORNIA

HELP WANTED

FOREIGN—DOMESTIC Employment Oil, Chemical, Industrial. Write for details without obligation. Accredited Personnel Services, P. O. Box 6006, New Orleans 14, La.

SITUATION WANTED

PETROLEUM ENGINEER, 31, married, 7 years production, unitization, and waterflood experience in Louisiana, Texas, Arkansas, and Mississippi; desires position with chance for advancement. Box L-714, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, M. S., 46. 15 years stratigraphic, structural, subsurface, wellsite, core and surface experience. Publications in U. S., U. K., Australia. Full resume on request. Will travel. Desires position in oil exploration. Box L-648, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: B.S., 33, married; 8 years experience. Waterflood evaluation, design, installation, and operation. Primary completion and operations. Box L-717, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPERVISER, 50, 31 years with major oil company. Experience in drilling and producing in Gulf-Coast, South, Central, West Texas and Louisiana Gulf-coast and off-shore. Roustabout to Production Superintendent. Presently employed as a production supervisor. Desire employment with aggressive small or independent oil company. Box L-738, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION GEOLOGIST—8 years subsurface experience in Dakotas, Montana, Southern Canada and Powder River Basin with major company, mainly stratigraphic work with some geophysics and administration, member A.A.P.G., presently employed, desires overide and/or salaried position with small company or anyone with capital to invest in above areas, will relocate, can arrange for personal interview anywhere in U. S. if contacted before April first. Box L-733, The Oil and Gas Journal, Tulsa, Oklahoma.

CIVIL ENGINEER, married, 32, 6 years experience oil field design, construction, & surveying, desires position with future potential. Resume & references upon request. Box L-735, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST 12 years experience in petroleum exploration, mainly Rocky Mountains. Employed in supervisory position by company showing little desire to expand production. If you need someone with original thinking to generate first class drillable prospects I'm sure I can help you. Box L-737, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERING graduate with 12 years' field and 10 years' office experience, including drilling, testing, completing, producing, workover, equipment, negotiating with contractors, cost analysis, evaluations, reserves and reports. Now employed by major company in New York. Will stay in New York or relocate within USA. Box L-736, The Oil and Gas Journal, Tulsa, Oklahoma.

RIG MAINTENANCE Mechanic: 20-years experience. Recommendations on request. Will relocate. Call: J. E. Jones, 4714, Kilgore, Tex. or write; 406 Florey Ave.

PHOTOGRAPHER: 7-years experience oil industry. Public relations, advertising. Stills, movies, color, processing, training films. Presently employed. Box L-744, The Oil and Gas Journal, Tulsa, Oklahoma.

GASOLINE PLANT superintendent— Age 44, 25 years experience in all phases of the gas industry, including construction operations, maintenance. Furnish references. Available immediately. Box L-743, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST OF managerial capacity available. Broad exploration experience, 24 years domestic and South America. Experienced in joint ventures. Box L-742, The Oil and Gas Journal, Tulsa, Oklahoma.

PERSONNEL DIRECTOR, 10 years experience personnel director medium sized oil company. Organized, developed, administered program including employment, benefits, safety, personnel policies, organization planning, other related areas. Close contact all levels management, field and office. Box L-740, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PROFESSIONAL ENGINEER—11 years experience design and development oil and gas production equipment and gasoline plants desires research and development position. PO Box 7423, Dallas 9, Texas.

GEOLOGIST: 38, 14 years domestic and foreign experience. Subsurface, wellsite, development and exploration geology. Drilling programs, reserves, secondary recovery, appraisals, evaluations. References, resume on request. Box L-734, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS SERVICE

DELAWARE CORPORATIONS formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

ROYALTIES

HIGHEST PRICE paid for oil and gas income royalties, overrides, oil properties. A. S. Berry, 109 Midco Bldg., 302 South Cheyenne, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

2,700 acre block eastern Kansas. 3 potential sand pays to 1,000'. Good area, 10 yr. leases. Sell $1.50 per acre outright or drill for $3,500 giving 50% interest. PEDCO, 2900 E. Elm, Wichita, Kansas. Phone MU 2-4814.

FIFTEEN THOUSAND acre block, state oil lease, Luna County, N.M. for sale, or will lease with drilling obligations, adjoins Major Company's leases, who will support test drilling, area on defined Structure. E. R. Wright, P. O. Box 423, Deming, N. M.

DEVELOPING shallow production areas—Eastern Kansas Oil Counties. Ideal tax money projects. John P. Habiger Real Estate, 2109 Mitchell RD., Lawrence, Kansas.

Have buyer's for Oil and Gas Producing Properties. Box L-729, The Oil and Gas Journal, Tulsa, Oklahoma.

KENTUCKY—2,800 acres, Casey County, $5.00 acre. All or part. North of exceptional play. Box L-728, The Oil and Gas Journal, Tulsa, Oklahoma.

EASTERN KANSAS—Proven reservoir, Mississippi Chat at 1,000 foot, 10,000 bbl. oil per acre. 530 acres, ½ working interest for $4,000. Experienced engineer. Contact George Newland, Route 3, Cherryvale, Kansas.

WILLISON BASIN in Dakota—oil and gas mineral leases. Shallower drilling; six possible pay zones; drilling operations of two wells to start within 60 to 90 days, on large block. For available direct interest or farmout, write: P. O. Box 495, Aberdeen, South Dakota.

FOR SALE— up to ½ interest in 80 acres to Barrtlesville Sand, 750 ft. depth. Proven territory. Montgomery County, Kansas. Box L-722, The Oil and Gas Journal, Tulsa, Okla.

50 ACRES Eastern Kansas. Diagonal offset Bartlesville Sand 700 ft. Need help on drilling. Reply: Box L-718, The Oil and Gas Journal, Tulsa, Oklahoma.

14 OIL WELLS, 5 water injection wells. 560 acres. Production, approximately 20 barrels daily. 700 ft. depth. On pipeline. Engineers say drilling additional wells will make a money making, long lived flood. Southeast, Kansas. Box L-715, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL AND GAS MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2,000 acres. Write quickly to: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that 999.02 acres of land in five parcels, within the known geologic structures of the Clareton field, Wyoming, and the Hugoton field, Kansas, are offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., April 14, 1960, when bids will be opened. Full details of the offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Adjudication Unit.

ELECTRIC LOGS

ELECTRICAL LOGS, several thousand. West Texas-Southeast New Mexico. Bargain price. Box L-727, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Complete or near complete set 1"=100 electric logs for Mississippi. Box L-732, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

WELL ESTABLISHED Canadian supply company, situated in Edmonton, Alberta, requires other lines to handle. Reply to: Box L-683, The Oil and Gas Journal, Tulsa, Oklahoma.

FINANCIAL Contacts, Underwriters, Private Brokers reached. No shopping. Confidential. Send details to Consultant—817—51st Street, Brooklyn, N. Y.

MONTGOMERY COUNTY, Kansas, oil and gas mineral leases. Several Bartlesville wells producing from 1,200 ft.; possibility of Arbuckle wells about 1,800 ft. Have drilling equipment. Want financial partner to help develop. Write: P. O. Box 2025, Tulsa 1, Oklahoma.

NEW PRODUCTS WANTED—Well-established, responsible company with complete facilities for developing, manufacturing and marketing oil field equipment is seeking new or improved products, preferably patented or patentable to add to its presently well-known line. Royalty basis or outright purchase. Initial submission should identify product and general use without revealing engineering and confidential detail. Submissions will be handled promptly and confidentially. Box K-994, The Oil and Gas Journal, Tulsa, Oklahoma.

OLD EXPERIENCED, Responsible Ohio Oil and Gas Producing Company now operating in practically all active areas of Ohio, has wildcat, semi-proven and proven acreage to offer as well as a completely integrated management, development and operational organization to supervise service and manage your Ohio operations. Inquiries are invited from individuals, companies and other interested parties. References available. Box L-745, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW ITEMS WANTED

by modern, well established and experienced company with complete development, manufacturing and marketing facilities. Interested in new, patented or patentable oil field specialties or equipment items on royalty basis or outright purchase. Give identification and general use of product in reply to:

BOX L-633

THE OIL AND GAS JOURNAL

TULSA, OKLAHOMA

ENGINEERING SERVICE

RIVER DIVERSION, BANK PROTECTION, PILE DRIVING

Contractor-Engineer

KENNETH W. HENSON

P. O. Box 218 **Phone 693**

Pauls Valley, Oklahoma

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that 177.96 acres of land in two parcels within the known geologic structure of Temple Canyon Field, Moffat County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 p.m., M.S.T., May 6, 1960, when bids will be opened. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado. Dale R. Andrus, Land Office Manager.

(Continued from page 143)

ft., Lower Tuscaloosa 10,936 ft. Discovery well Northeast Freewoods field.

NORTH TEXAS

Wise County:

Lone Star Producing Co. 1 Kate Ann Stanfield "A," 1 mile northwest of Boonsville Bend conglomerate gas production, 3 miles northeast of Bridgeport Lake on Phillip Nicholas Sur., A-654. IPF 60 BOPD, 24/64-in. choke, GOR 4866:1, 39°, 5,251-61 ft. conglomerate. TD 5,400 ft. Suggested name is Stanfield 5,250-ft. Conglomerate field.

SOUTHWEST TEXAS

Duval County:

Afroma Oil & Gas Co., Inc., 2 Tiry W. Horn et al., Section 53, J. Poitevent Sur., A-431, 5 miles west of Freer. IPP 25 BOPD (net), 20°, 70% water, GOR 100 cu. ft. per bbl., perf. 1,496-1,500 ft., Cole sand. TD 1,846 ft. New pay in North Government Wells field.

Ralph Rowden 3 Alice A. Wright et vir, Section 47, Share 1-B, Arnold & Barrett Sur., A-768, 18 miles northwest of Freer. IP 41 BOPD (net), 6% water, 15/64-in., 21°, TP 30 psi., GOR 225 cu. ft. per bbl., perf. 1,141-49 ft., Mirando sand. TD 1,154 ft. New pay in Neely field.

Cox & Hamon 15 Driscoll, N½ Section 55, Sweden Farm Lots, Santa Rosalia Grant, 17 miles west of Benavides. AOF 1 M.M.c.f.d., dry gas, shut-in TP 996 psi., perf. 3,156-59 ft., Government Wells sand. TD 3,276 ft. New pay in Rosalia-Mag field.

Fred A. Rigby 1 Richardson et al., Section 5, GB&CNG Sur., 9 miles north of Bruni. AOF 3,400 M.c.f.d., dry gas, shut-in TP 440 psi., perf. 1,590-94 ft., Frio. TD 2,836 ft. New pay in Richardson field.

LaSalle County:

Jocelyn-Varn Oil Co. and J. M. Taylor 1 Henderson Coquat, J. W. Peacock Sur., A-594, 13 miles southeast of Cotulla. AOF 550 M.c.f.d., dry gas, shut-in TP 2,215 psi., perf. 5,142-52 ft., Wilcox. TD 6,133 ft. New-field discovery (workover of old dry hole).

Starr County:

J. S. Abercrombie Mineral Co., Inc., 1 Santana Carrera, Share 65, Juan Cisneros Porcion 79, A-66, 6 miles north of Rio Grande City. IP 200 M.c.f.d., 10/64-in., shut-in TP 235 psi., Frio. TD 4,515 ft. New field (West Zim) 1½ miles west of Zim-Ricaby field.

James G. Brown & Associates 1 Lopez, Tract 11, Porcion 88, 5 miles east of Rio Grande City. AOF 1,300 M.c.f.d., dry gas, shut-in TP 882 psi., perf. 2,366-69 ft., Frio. TD 2,372 ft. New field (East La Union).

LEGAL

SALE OF OIL AND GAS MINING LEASES, TRIBAL AND ALLOTTED INDIAN LANDS, DEPARTMENT OF THE INTERIOR, BLACKFEET INDIAN AGENCY, BROWNING, MONTANA. Sealed bids will be received until 10:00 A.M., Mountain Standard Time, March 16, 1960 and opened at that time in the office of the Superintendent, Blackfeet Indian Agency, Browning, Montana, for leasing of 23,223.04 acres of Tribal and 25,243.80 acres of Allotted land located in Township 36 North, Ranges 6 and 7 West; Township 35 North, Ranges 6 and 7 West; Township 33 North, Range 6; Township 32 North, Ranges 13, 12 and 6; Township 31 North, Ranges 11, 12 and 13; Township 30 North, Ranges 11 and 12 in Glacier County for Oil and Gas Mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing an inquiry to the Superintendent of the Blackfeet Indian Agency at Browning, Montana.

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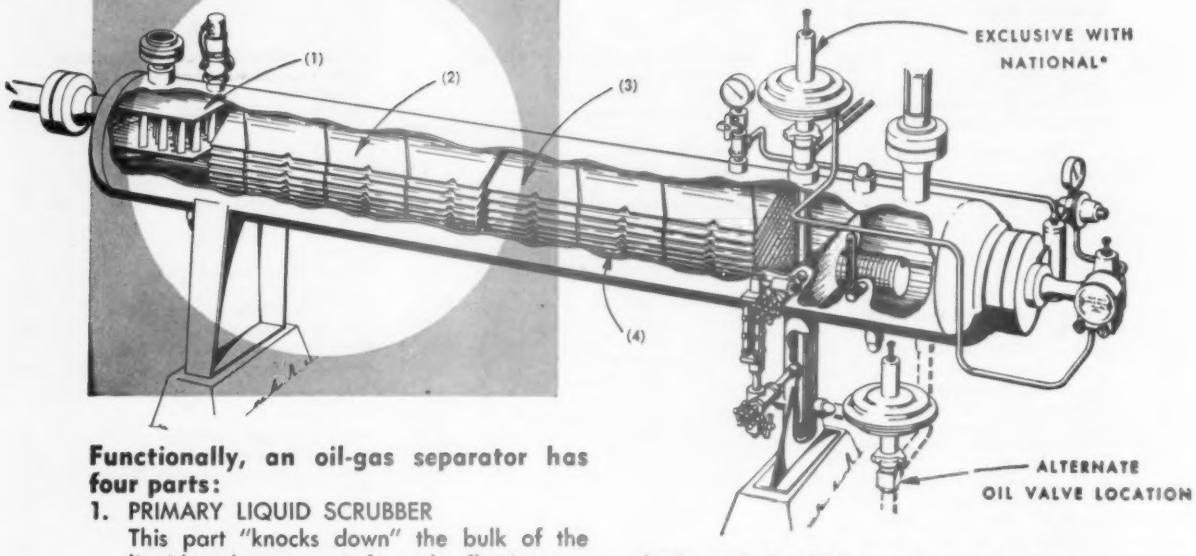
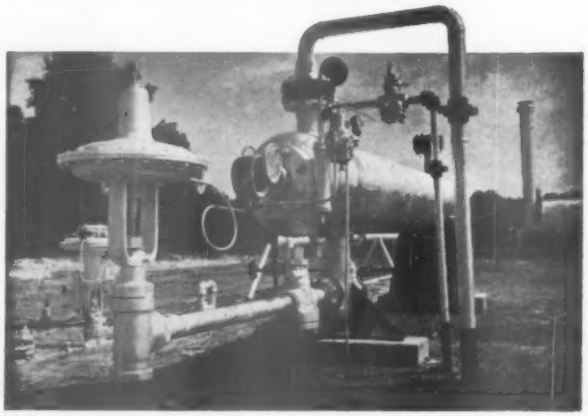


Functionally, an oil-gas separator has four parts:

1. PRIMARY LIQUID SCRUBBER
   This part "knocks down" the bulk of the liquid and removes it from the flowing gas stream immediately.
   National's present design is the result of field tests using full scale operational models which utilized numerous scrubbing elements. From these tests National's present design was found. Today, when you buy a National MONOTUBE Separator, you buy experience, not experimentation.
2. MAIN GAS SCRUBBER
   Also as a result of these tests, proper spacing and length of Main Gas Scrubber plates was discovered, so as to effect the greatest liquid removal from the gas stream.
3. FINAL GAS SCRUBBING
   The multiple field tests with flanged components dictated our design. National's "straight-vane" design accomplishes final liquid removal without the use of "excelsior-like" elements which are prone to be plugged with waxes, sands and other extraneous materials, including hydrates inherent in the normal oil-gas and distillate production operations.
4. OIL DE-GASSING COMPARTMENT
   What effects oil de-gassing? (a) Length of time in compartment. (b) Surface area of oil body. (c) Scrubbing surfaces to remove entrained gases. When (a), (b) and (c) are at a maximum, oil de-gassing is best. National's full-scale field testing found the proper ratios.



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A field-proven, non-freeze liquid valve, particularly useful on high gas-oil ratio wells where entrance temperatures are near hydrate point. Ask your National man about this exclusive feature.

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NATIONAL TANK COMPANY

TULSA, OKLAHOMA

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CABOT SAYS: SELECT THE EXACT SIZE UNIT FOR YOUR PUMPING NEEDS

Why spend more for a pumping unit than you need to? In today's oil economy this becomes an important sobering question. That's why Cabot aims at holding your pumping costs down . . . That's why Cabot builds reserve ruggedness in every unit and then backs these units with 24-hour field service.

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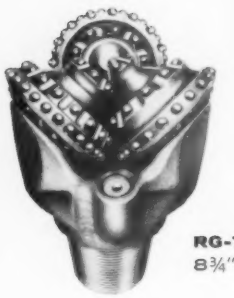
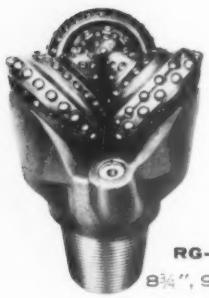
3 New HUGHES bits



RG-7J
8¾"

RG-1J
6" – 9"



RG-2BJ
8¾", 9", 9⅞"

...cut hole time in hardest digging

Footage and penetration rate are being substantially increased with the three new Hughes "compact" bits pictured here. They are taking the place of the R-1, first of the "compact" bits, R-1J, RG-1 and R-2. Whereas the first R Series bit was an all-purpose hard formation bit, the three new Hughes bits have been designed to drill specific segments of the extremely hard abrasive formations.

As an example, take the RG-7J: It is being used in drilling lime, dolomite and hard sandy shale (the softer of the extremely hard formations), and at the same time is taking over some of the W7R digging, with phenomenal results.

Cones of the RG-7J are deeply intermeshed to give them more action on bottom, desirable in getting faster penetration. The larger compacts on this bit provide more cutting area and increase footage. Coarser pitch, resulting from wider spacing of the compacts, and interruptions of the lands make it possible for the RG-7J to economically drill formations previously drilled by milled-cutter bits. Compacts on the gage surfaces greatly reduce gage wear.

The RG-1J is distinguished from the R-1 by the compacts on the gage. It is designed to drill the medium range of the extremely hard abrasive formations. The performance of the RG-1J in these formations has been outstanding.

The RG-2BJ — identified by spearpoints on each of the three cones — has larger diameter compacts and a maximum number of compacts on all rows and on the gage surfaces. It is the most rugged of the R Series bits. It is used to drill the hardest of the extremely hard abrasive formations, such as the bromides and hard quartzitic sands. In many instances, the RG-2BJ has doubled and trebled the footage formerly obtained in these formations.

HUGHES TOOL COMPANY

ORIGINATOR AND WORLD'S LEADING DEVELOPER OF CONE-TYPE ROCK BITS